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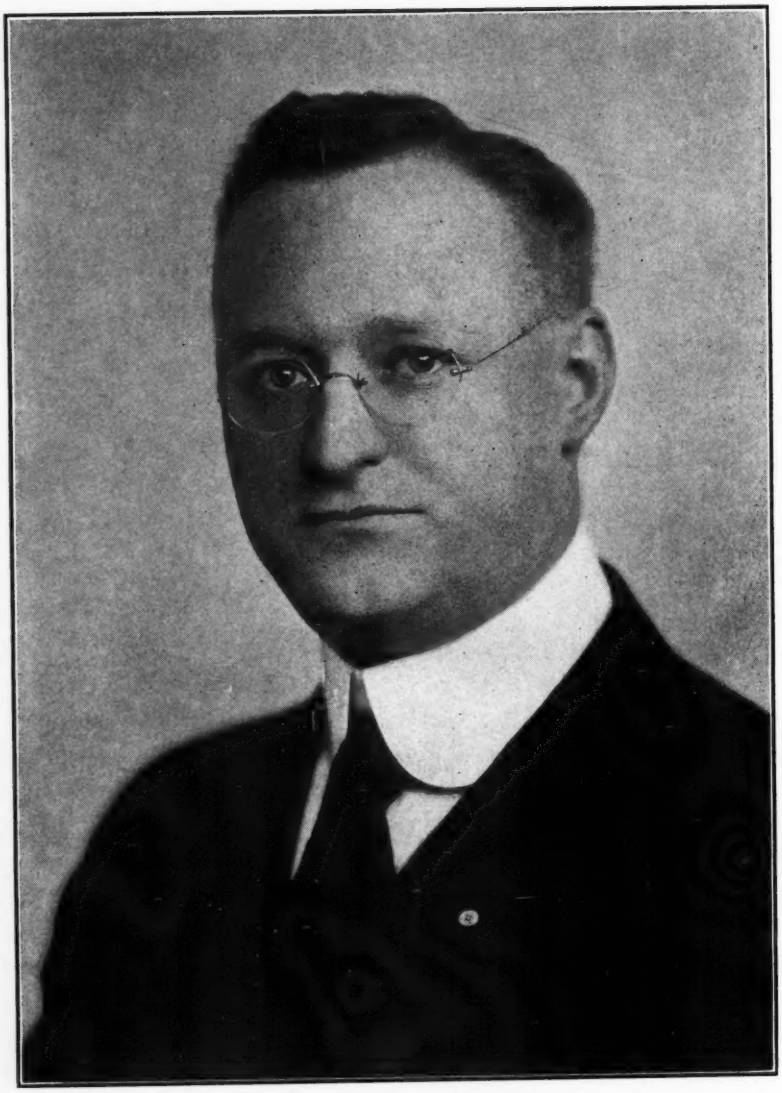

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UNIV. OF MICH.

The International Journal of Orthodontia

Editor: Martin Dewey, D.D.S., M.D.

VOL. III ST. LOUIS, DECEMBER, 1917 NO. 12

ORIGINAL ARTICLES

MODERN PRINCIPLES AND METHODS IN ORTHODONTIA*

BY CALVIN S. CASE, M.D., D.D.S., CHICAGO, ILL.

IN response to the very kind invitation of your program committee to present a paper and a clinic before this society and wishing to avoid so far as possible subjects of a former controversial nature, which time and the cooperating forces of experiences are the true molders toward truth and progress, I have concluded that I can not bring to you anything that will be of greater interest, especially to the younger members of this society, than the well authenticated history from the very start to the finish of some typical case that is not uncommon in practice, and which requires a number of distinctive characters of movements and appliances for its correction and retention. This will give me an opportunity to call your attention to some of the most modern principles and technics employed in my practice and teaching for the correction of malocclusion. Then as an interesting and perhaps instructive supplement to the paper and its illustrations, the case will be continued at my clinic, which will give an opportunity to those who desire to more closely examine the stock material and the finished appliances set up on the models, showing different stages of the case, and every detail in regard to material, sizes, technic construction, assembling, adjustments and application of the various forces of correction, and retention.

The case which I have chosen to present for this paper is one of peculiar interest and applicability, because, in the first place, it teaches the importance of a careful and thorough study of every case, however apparently simple and uncomplicated it may at first appear, and why an artistic observation of the facial outlines should be regarded as one of the foundation principles of intelligent diagnosis.

*Read before the Seventeenth Annual Meeting of the American Society of Orthodontists, Excelsior Springs, Mo., Sept. 5, 1917.

Second, it shows how, from the local cause of adenoids, followed with long continued early mouth-breathing and inhibited maxillary development, may arise three distinctive characters of malocclusion; i. e., decided malalignments of the permanent teeth, open-bite or infra-occlusion of the front teeth, and finally a bodily retruded position of the upper incisors and entire intermaxillary process.

Third, it will conclusively demonstrate the remarkable effectiveness of the resilient forces of exceedingly light arch bows and delicately constructed bands and unique attachments, which have been aptly termed the *midget appliances,* and which are particularly adapted for the correction of the common malalignments of children's teeth.

Fourth, it will show the most modern technic and application of the regular bodily movement apparatus whose principles of force have been successfully employed for twenty-five years for the correction of the most extensive retrusions and protrusions. This was named the *contouring apparatus,* because of its early surprising capability of developing and correcting depressed facial contours through a bodily labial movement of the front teeth. It was afterwards discovered that this same principle of applying force to the teeth, according to the law of levers of the third kind, was quite as applicable for bodily lingual movements of the front teeth; and in recent years this same mechanical principle has been extensively employed for bodily movements of the teeth in every direction. In fact, no teeth were ever moved bodily except through the application of this principle of force, which consists in the establishment of independent points of fulcrum and power in relation to the alveolus or area of work. Even that valuable addition to our technic principles of torsional force for the bodily movements of teeth, presented recently by Angle, and exemplified in his new appliances, is deducible in its direct action to that of a lever of the third kind.

Fifth, this case will also present an opportunity to examine at the clinic the most modern methods in the technic construction and action of the regular bodily *working* retainer, it having been necessary to remove the regular bodily movement apparatus before its work was completed, as will be more fully explained.

Sixth, you will also have an opportunity to examine the regular six-band retaining appliance similar to those that have been employed in nearly every case in my practice for over twenty years.

As Dr. Carl Case has kindly consented to assist me at my clinic, if facilities and time are offered, we hope to show the technic construction of this appliance.

The case referred to is that of a girl, about thirteen years of age. The first impressions, the plaster casts of which are shown in Fig. 1, were taken Sept. 27, 1916. Both right and left sides were so alike in buccal occlusion it is unnecessary to show but one side, as you will see by other views. It will be noticed in examining the buccal occlusion that the upper denture is slightly distal to normal, and that the upper incisor teeth, though appearing to be prominent at their occlusal edges, their roots are decidedly retruded, being labially inclined from deepened incisive fossæ. The apparent prominence of the upper incisor crowns is enhanced because of the retruded malposition of the lower incisors, which is due to the unfortunate extraction of a lower lateral incisor, which I am told occurred

soon after its eruption in lingual malalignment. From the facial cast it can be seen that the chin and lower lip are quite perfectly posed, and in harmonious relation to the main or unchangeable features of the physiognomy, showing that the mandible and lower denture are in normal relations. The moderately retruded outlines of the upper part of the upper lip with the abnormal deepened nasolabial lines, enhancing the prominence of the cheek bones, gave to the physiognomy, especially from a front view, an unnatural and decidedly unesthetic broad and flattened appearance. The facial diagnosis, in connection with the

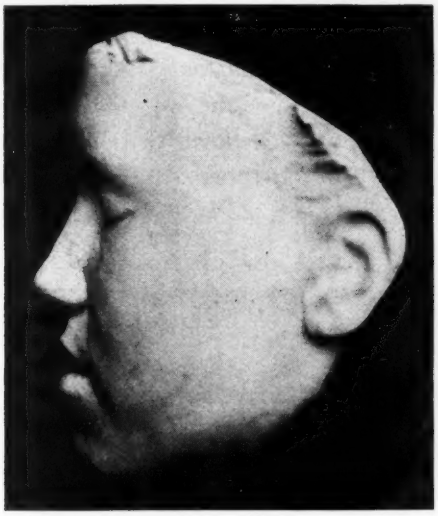

Fig. 1-*A*.

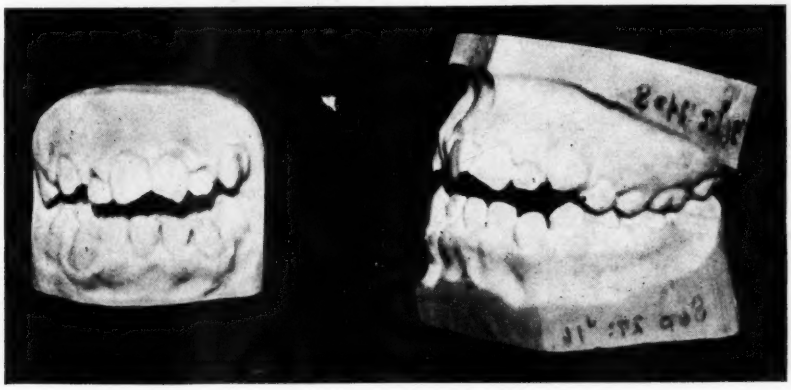

Fig. 1-*B*.

retruded relations of the upper incisors and marked open-bite malocclusion, definitely indicates that its cause was early adenoids and mouth-breathing—the former inhibiting the normal development of the maxilla, and the latter, which doubtless continued through several years of early development, resulted in the open-bite malocclusion.

From the above diagnosis it will at once be observed that the case belongs in Class III of the dento-occlusal classification, and that the main and imperative part of the operation demands a bodily labial movement of the upper incisors

and incisive alveolar process, accompanied by a general maxillary enlargement through bone growth development, to correct dental and facial relations.

In all cases in which a bodily movement of the front teeth is demanded, it is first quite imperative in my practice that they be placed in alignment so that they can be brought evenly within the firm grasp of the power arch bow, and thus moved bodily in phalanx.

For the purpose of accomplishing this first stage of the operation, and incidentally to correct the alignment of the lower teeth and open-bite malocclusion, I first employed the apparatus shown in Fig. 2, which is similar in general character to that which has been commonly employed in my practice for years, for the correction of all simple irregularities in alignment and malposition of the teeth of children and youths. It is that which derives its main motive force from the resiliency of very light arch bows which range in diameter sizes from Nos. 22 to 26 (.025″ to .06″). To those who are not familiar with the gauge sizes, it may be well to state that No. 22 is about the size of a small pin, and No.

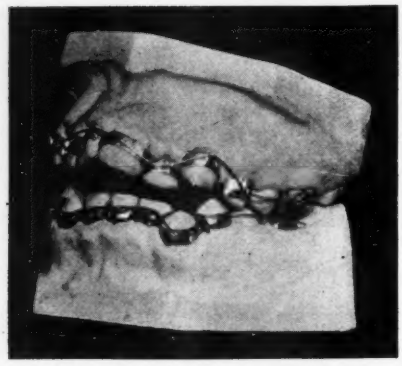

Fig. 2.

26 is but a trifle larger in diameter than the thickness of a 28 gauge plate with which all of you are familiar.

There is no objection to employing any of the alloys of gold and platinum for the arch bows, if specially drawn; but for all intents and purposes 18 per cent nickel spring German silver wire if properly drawn, will answer every requirement. Few orthodontists, who have not tested the possibilities of high grade German silver, can realize the high degree of spring temper and resiliency that can be given to arch bows of this material when drawn *cold* from very much larger sizes.

The arch bows of the above small sizes, if intended for the purposes referred to, should be drawn from No. 14 or No. 16 high grade spring German silver wire, without annealing, and kept cold in the process with a small bag of pounded ice over the drawn plate.

The particular characters of malocclusion for which these very light resilient arch bows are especially adapted, are those which are commonly composed of a variety of malpositions that arise during the early eruptive stages of the permanent teeth, and which are commonly due to local causes. I need not enter into

extensive detail in regard to these midget appliances or the technics of the delicate bands and attachments here, as this was fully published in the April, 1917, number of the *Dental Items of Interest.* Nor can they be appreciated without seeing the appliances, and noting with what ease and facility the treatment adjustments can be accomplished. In the apparatus here shown the arch bows are No. 26. The bracket attachments on the lower incisors—which will be better shown by an examination of the appliances—are for direct intermaxillary

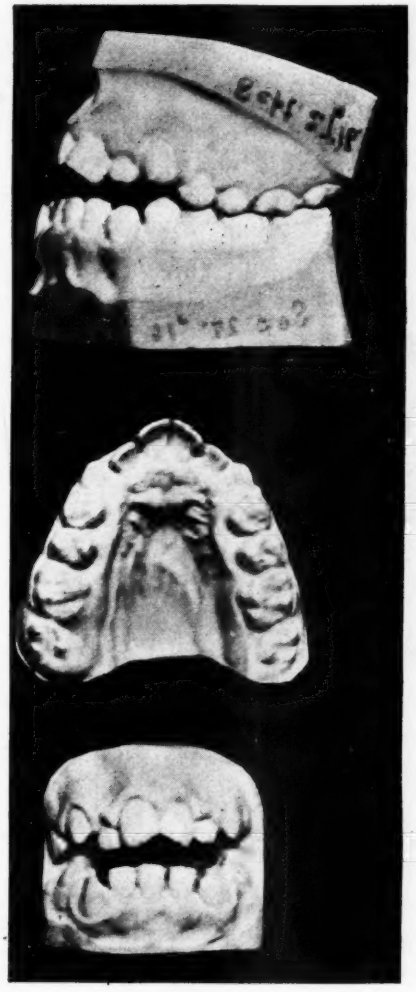

Fig. 3-*A*.

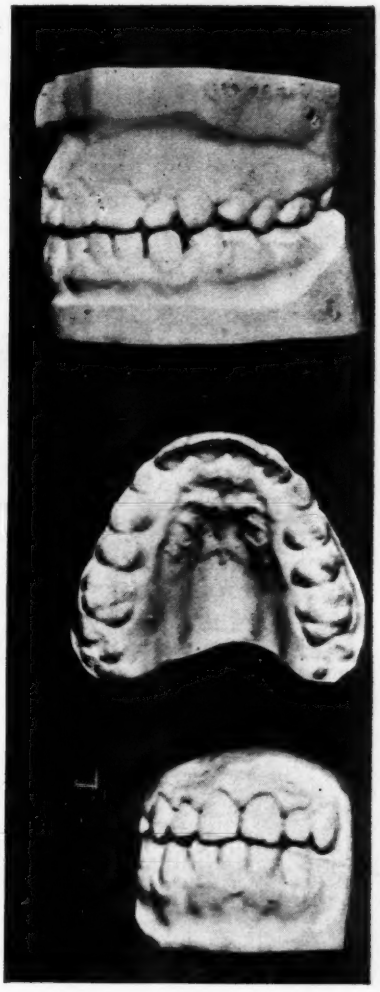

Fig. 3-*B*.

elastics to aid in closing the open-bite. After this apparatus was placed on the teeth, and the patient instructed in the adjustment of the elastics, I did not see the case oftener than once in two weeks. Occasionally at these times, the arch bows were removed and replaced with fresh ones, and minor treatments performed as the changing conditions demanded.

In less than four months after these appliances were attached, the upper front teeth being sufficiently in alignment for the bodily movement apparatus, they were removed and impressions were taken for the models shown on the right of

Fig. 3. On the left is a view of the beginning models. Then the upper contouring apparatus, as shown in Fig. 4, was made and placed. The power arch bow in this case is No. 16 spring German silver rolled to a ribbon form of about two-thirds its diameter over the labial area, and placed to apply its force at the gingival line of the front teeth, and not upon rootwise extensions. For younger patients, I now rarely apply the power above the gingival margins, and I often place the fulcrum bow near to the middle of the crowns. It must be seen, however, that the further the line of power is placed from the area of alveolar work, and the nearer it is to the artificial fulcrum, it proportionately decreases its mechanical advantage for bodily movement, and consequently increases the strain upon the power arch bow and its molar anchorages.

The only object in applying the power upon rootwise attachments to the front teeth is to increase the mechanical advantages of the whole apparatus, which is quite important when extensive bodily movements of front teeth are demanded for older patients.

Those who find it difficult to construct the upright attachments on the upper

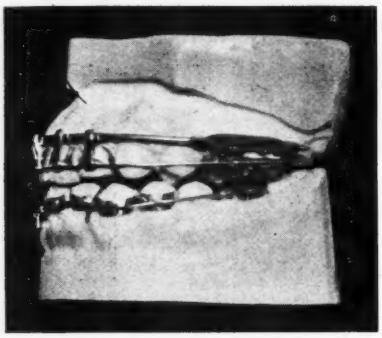

Fig. 4.

incisors in which the power bow rests back of the uprights, may prefer, for young patients, to employ open tubes to clasp around the bow, or hooks which lap over it, both soldered to the bands at the gingival margins.

If they wish to combine the torsional bodily force with this, they can easily construct the hooks to exactly fit a ribboned portion of the power arch bow which is rolled at such an angle that when placed in its front attachments the distal ends of the bow, at equilibrium, will stand below the occlusal plane, making it necessary to lift them to their positions in the U-tubes, as illustrated in my article in the *Dental Items of Interest.*

I would advise, however, from some experience I have had with this method, that the fulcrum bow be not omitted, and the power bow be not less than No. 19. I hope this will not be regarded as an adverse criticism of Angle's new appliances of which I have no right to judge from an experienced standpoint.

The amount of correction at this time, of the infra-occlusal position of the front teeth shown by the front occlusal models in Fig. 3, was accomplished mainly by direct intermaxillary elastics attached to the midget hook and bracket attachments upon the front teeth.

At the anniversary clinic of the Chicago Dental Society, Jan. 27th, 1917, four months after beginning the operation, the patient, attended by her older sister, kindly consented to appear and patiently submitted to hours of examination and questioning by hundreds of dentists. She was wearing at that time the upper contouring apparatus shown in Fig. 4, a duplicate of which you will have an opportunity to examine. The plaster dental and facial casts and the mounted apparatus which had accomplished its work up to that time, were shown and explained. I am particular to mention this circumstance—parenthetically—because it establishes the unquestionability of the above dates. I wish to say also, the appliances and models of this case were employed to partly illustrate a paper which I read before the Southern Dental Clinic at Atlanta in March, 1917, and no doubt will be published with the proceedings of that meeting.

You will pardon me for saying that I hesitated in presenting the true chronological history of this case for fear that some one might imagine that I regarded rapidity of orthodontic movements as the test of the value of methods. Whereas, it will be found throughout my entire teaching that that particular phase of an operation is negligible compared to the selection and application of methods which are best suited to the needs of the case in hand; and which will accomplish the most favorable results. In fact I doubt if the best accomplishments can be attained in the correction of many cases of malocclusion in an attempt to hurry the operation. While time, ease of adjustments, painlessness, nonirritability and artistic effects are of great importance, they should never stand in the way of truer principles of practice, even though lacking in some of these most desirable qualities. Occasionally, as in this instance, we will meet with cases which safely respond with phenomenal rapidity, if the forces are skillfully adjusted to their needs.

The second lower apparatus, which is shown in Fig. 4, was placed a few weeks after the patient had become accustomed to the upper. The lower front teeth were now nearly in alignment and consequently in a position to be more firmly grasped by a No. 23 expansion arch bow which would sustain, with greater stability, the distances between the molars and the front teeth and exert a slight general expanding force, and at the same time permit the proper action of the disto-mesial elastics for the reinforcement of the upper anchorages and the adjustment of the occlusion. Provision will be seen on the lower for the direct intermaxillary elastics to continue the extruding force—particularly the upper canines and premolars.

I do not wish it to be inferred that the forces of any of these appliances alone were the only treatments employed, because in this, as in nearly every case, the skillful orthodontist will employ subsidiary forces as the case progresses, which are quite as important as the main forces for keeping the machinery in perfect coordinating action. I obtain these side forces mainly with light silk ligatures and elastics. Moreover, it is the rule in my office that when bands or their attachments have outgrown their usefulness, or they are not properly constructed or adjusted to perform their best work, they are immediately removed and corrected—more often with new bands and attachments for varying the force.

There is one thing to which I wish particularly to call attention as one of the

recent and most important improvements in the technics of anchorages. It is the employment of the U-tubes instead of closed or seamless round tubes for the ends of the arch bows. For the very light resilient bows a seamless tube on one side and a U-tube on the other is usually sufficient. But for larger bows, with locked attachments to the front teeth, which are designed to exert a lateral expanding force, and especially those which are intended to exert a bodily torsional expanding force, U anchorage tubes are invaluable, because they enable giving to the bow any desired spring force, and with assured ease of assembling. And then when desired, the ends can be readily lifted from the U-tubes and given an extra spring force and replaced without the necessity of unlocking the bow from its front attachments. This is especially important for the more rigid power arch bows of the contouring apparatus. It occasionally becomes necessary to

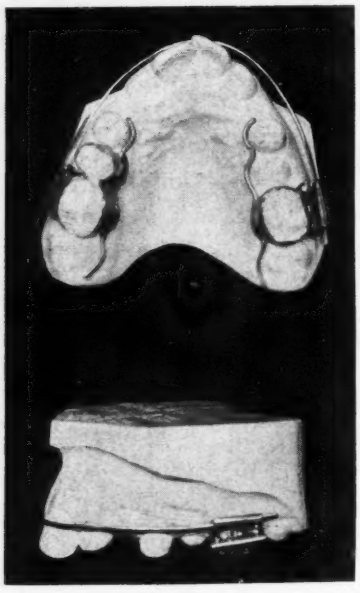

Fig. 5-*A*.

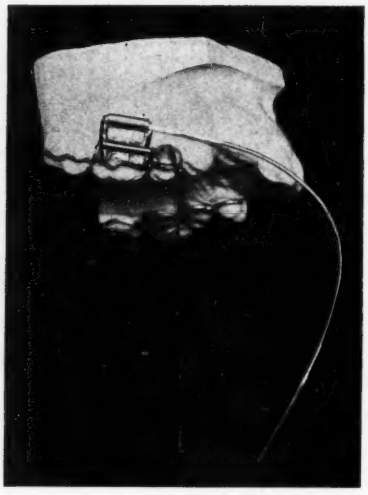

Fig. 5-*B*.

remove these bows to increase or decrease their expanding properties, or to correct some irritating action that arises at the front. Formerly this was impossible without a complete removal of all the front bands or the stationary anchorages, which is not always a very easy operation without slitting them. Now the countersunk nuts which lock the ends of the bow in the U-tubes are unscrewed and the bow is easily lifted out of its attachment at the back and then at the front, and as easily replaced, without disturbing any of the bands.

There is another important improvement of somewhat recent date in the technics of anchorages where great stability is demanded. In addition to the invaluable advantage of the two or three band stationary anchorages, this more recent improvement consists in applying the anchorage power above the gingival margins upon rootwise anchorage attachments, shown in Fig. 4. This places the direction of power more nearly in a line with the center of alveolar resistance, and proportionately increases the stability by decreasing the tendency to inclina-

tion movement. The rootwise method of applying force is invaluable in all bodily movements. Besides the labiolingual bodily movement of the front teeth, it is of great advantage in the bodily expansion of dental arches, and in bodily disto-mesial movements of both the front and back teeth to close interproximate spaces, from whatever cause, where it is important to avoid inclination movement.

Fig. 5 illustrates an appliance that has been constructed to show how a combination of torsional and rootwise forces may be employed in the bodily expansion of arches. The arch bow in this appliance is No. 19 special spring German silver, rolled distal to the canines, to a ribbon form of about two-thirds its diameter in thickness, and at an angle, in equilibrium, that will twist the ends of the bow one-quarter to one-third the way around when sprung into the U anchorage tubes, and in a direction so that the force of the upper, or rootwise edge of the ribbon will be exerted in a buccal direction. The lingually directed force of the lower edge is supposed to be more than neutralized by the direct expanding force of the bow.

This method has never been tried in my practice, but I have no doubt that

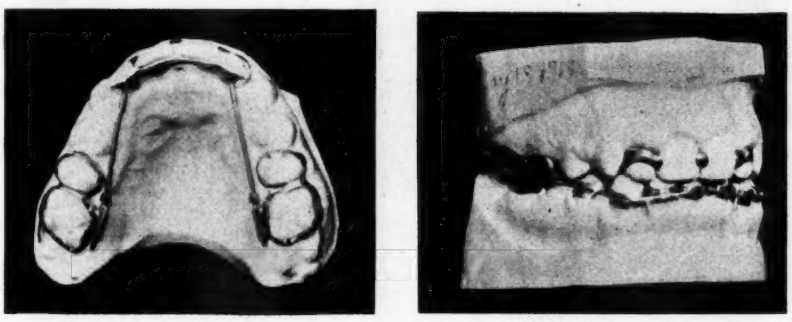

Fig. 6.

it is of considerable value, providing the arch bow is sufficiently large to exert the requisite force. Up to the present time, I have been fairly successful in the bodily lateral expansion of arches by applying the force upon rootwise extensions.

To return to the case under consideration: after the bodily movement apparatus had been worn about four months, I was informed that it would be necessary for the patient to return to her home in Oklahoma on account of the sickness of her father, and that I probably would not be able to see her but a few times until near the close of the operation. As the bodily movement of the upper teeth and the general correction of the malocclusion had progressed quite favorably, and fearing to trust to others in this advanced stage the treatment adjustments, I decided to place the bodily working retainer on the upper incisors, which would continue, more slowly but safely, their bodily movement.

Fig. 6 shows two views of the working retainer on the model of the upper teeth at this time. The lingual push bars are No. 19 spring German silver, fitted but not soldered into the thick-wall clasp-metal tubes which are attached to the clasp metal reinforcement-backing of the retainer. The distal ends of the bars at equilibrium are about ⅜ of an inch below the occlusal plane, and when sprung into the U-tube attachments on the lingual surfaces of the stationary anchorages, exert a labial force upon the roots of the incisors; which, in connection with the

action of the nuts at the mesial ends of the anchorage tubes, results in a bodily labial movement.

The object of the two-band stationary anchorages is to distribute the extrusive spring force of the bars and prevent a supra-occlusal movement, as would naturally occur if this force were sustained by single molar anchorages. The

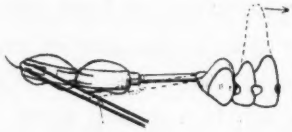

Fig. 7.

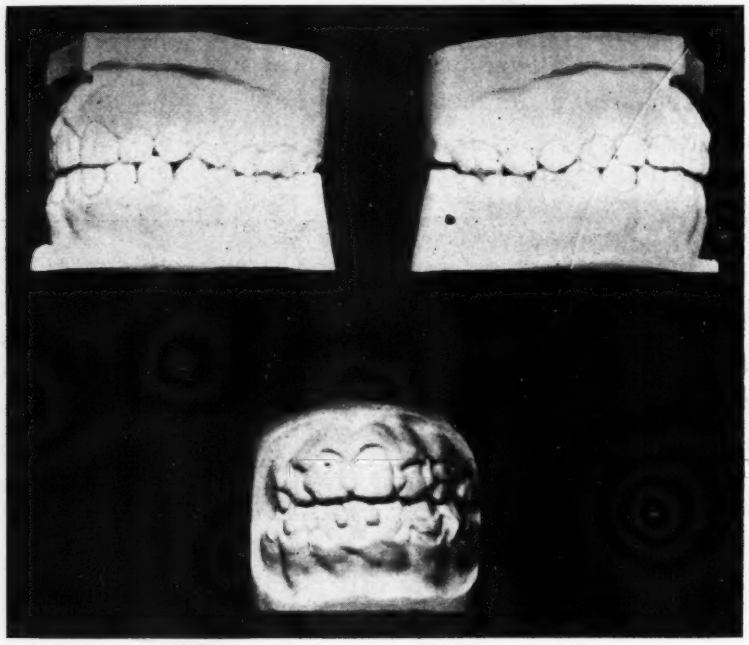

Fig. 8.

Fig. 9.

disto-mesial and direct intermaxillary and other forces were continued with this apparatus.

As stated in my textbook published in 1908, and illustrated with the drawing shown in Fig. 7, and also in a paper read before the Orthodontic Society in Paris in 1914, there is no reason why this bodily movement working retainer should

not be employed for many of the bodily labial movements of children's teeth, and in fact in all cases for young patients when the required movement is not extensive. It certainly has the very great advantage of inconspicuousness, and non-irritability to the lips. It admits also of perfect cleanliness, and like the six-band retainer, is, in my opinion, far the most artistic orthodontic appliance I have ever constructed.

During the absence of the patient, she very faithfully kept up the application of the various forces. She returned to me about two weeks ago. On Wednesday, Aug. 29, 1917, eleven months after starting the case, all the appliances were removed, and the impressions were taken for the plaster casts shown in Fig. 8. Notwithstanding the unfortunate fact that there are only three lower incisors, the dentures are in fair occlusion, which time will improve. Below is a front occlusal view of the teeth in which is faintly shown the final retainers in position. One may be able to see the supplemental spurs for the attachment of the direct intermaxillary retaining elastics for containing the extrusive force to prevent a return of the infra-occlusal position. Also the hooks on the lower for containing the disto-mesial intermaxillary force.

Fig. 9 will give a fair idea of the development in the facial outlines by immediate comparison with the beginning facial cast on the left. The plaster impression for the one in the middle was taken upon the removal of the regular bodily movement apparatus which was worn about four months. The impression for the one on the right was taken about one week ago.

When you come to examine the plaster dental models of the upper, made at this time, you will see that the roots of the incisors are abnormally prominent in relation to the alveolar process, especially above the ends of the roots. Therefore, if the upper incisors are retained in their present bodily labial position, the facial outlines will, no doubt, continue to improve through stimulated growth development.

DISCUSSION

Dr. C. A. Hawley.—Mr. President and Gentlemen: I am very sorry to be asked to open the discussion on Dr. Case's paper without having had time to read it carefully and give the matter more mature consideration, and I hope that anything I may say will be considered from that standpoint.

Anything that Dr. Case presents to a body of orthodontists is entitled to most careful and favorable consideration. We all know the work he has done for orthodontia and the long years he has devoted to the work. The results he has obtained in this case, it seems to me, are almost above criticism. One feature in the case has interested me very much which he has not made very much of; namely, beautiful occlusion of the teeth, and still the patient lacks one incisor. That is a matter perhaps Mr. Hanau could explain to us. He has been giving the matter for the last three or four years a great deal of study. I am very much impressed with the results that have been obtained with these very delicate appliances which Dr. Case has shown.

Dr. Case.—There is much in the illustrations of the paper which will be far better shown at my clinic. I have with me all the appliances showing the special attachments, and how they are placed and soldered. You will have an opportunity to see how readily and effectively the forces are applied and changed; and with what ease and rapidity these small resilient bows are wound in and out along the line of attachments from the U-tubes on the molar anchorages; and then after they have been worn a week or two, how readily they can be removed and replaced with new bows.

Dr. Lischer.—Why do you put on a new one?

Dr. Case.—Of course, you can easily straighten the original one, but they are so easily made and so inexpensive, if of German silver, one would hardly take the trouble. The action of this force, as in all resilient elastic forces, no doubt, has a great tendency toward stimulating the activities of bone growth development; especially is this noticeable in those cases of narrow arches during the early stages of secondary dentition where there seems to be insufficient room for the eruption of the incisors between the deciduous cuspids. In many of these cases where it would seem as if the spring of the bow would tend to drive the cuspid area into the arch and thus prevent labial area enlargement, it absolutely acts in the opposite direction. By forcing the lingually malposed teeth into line, they are made to act as expanding wedges, together with the renewed stimulation of growth, the arches are seen to assume the required proportion for the normal eruption of the permanent teeth.

Dr. L. S. Lourie.—I would like Dr. Case to explain the attachment of this fine expanding wire he uses. I did not get a chance to read the article in which Dr. Case mentions the use of this expanding arch. I would like to have him explain it in more detail. I was away from the city at the time the article was published and I did not see it, but I have heard those who have seen the appliance say that the little spring arch he uses is not fixed to the individual teeth. Am I right?

Dr. Case.—Yes.

Dr. Lourie.—That is an important point which should be emphasized in this article of Dr. Case's, and it will bear repetition because it is important. I believe it is a great improvement over the forms of thin arches such as the Angle ribbon arch or the Robinson appliance in which the arch is definitely fixed to each tooth. You have the reciprocal force of the spring. The spring as it acts has a changing reaction on all teeth, whereas with Dr. Case's model, the arch is not rigidly attached to the various teeth by means of the band, and allows the teeth to slightly adjust themselves as the spring changes. By not having the teeth rigidly attached to the spring arch, they are not so apt to be moved into positions not desired as a result of the reaction from some other tooth.

Dr. R. Ottolengui.—If I am correct in my understanding, I would emphasize the fact that by only using the arch once and starting every time with a new one, you are not complicating your work with the previous bends the same as when you use one arch all the time and endeavor to make new bends do new work.

THE THERAPEUTIC EFFICIENCY OF ORAL PREPARATIONS*

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ORAL HYGIENE

THE science of oral health treats of the preservation of the normal equilibrium of the oral cavity and its contents. The remedies intended for the maintenance of the health of the soft structures of the mouth and the teeth may be conveniently divided into those prescribed for specific diseased conditions and those employed as hygienic measures for daily use. In the mouths of most civilized races, the mucous membrane, on account of the present perverted methods of preparing and seasoning our foodstuffs, is found more or less always in a state of mild chronic inflammation, while the hard structures of the oral cavity, the teeth, are subjected to a process of molecular destruction known as dental caries. Dental caries is not a disease in the same strict sense of the word in which the latter term is usually applied, but is a process distinctly allied, both in its chemical and bacteriologic aspects, to the general phenomena of putrefaction (Goadgy). While certain preliminary intrinsic causes; i. e., anomalies of position, outline and structure, etc., may profoundly alter the predisposition of the tooth to carious destruction as a whole or in part, dental caries will always occur if a tooth is subjected to the influences of suitable environments, and it does not matter whether the tooth forms an integral part of the anatomy of the individual, or whether it is separated wholly or in part from its original owner. The late Miller has formulated an explanation of the nature of the carious process, which, at present, is universally accepted, and which defines this phenomenon as; a chemico-parasitic process consisting of two definite states; i. e., the decalcification of the tissues and the dissolution of the remaining organic matrix. In caries of the enamel, the latter phenomenon is not observed on account of the minute quantities of organic matter contained therein. The accumulation of carbohydrate food debris on and about the teeth is held directly responsible as being the incipient faction in the production of the decalcifying agents. The direct or indirect splitting up of these carbohydrates by fission fungi into acids; i. e., principally lactic acid, furnishes the attacking agent which decalcifies the enamel. The further changes occurring in this process of tooth disorganization do not interest us at this moment.

The hygienic care of the mouth intends primarily to keep the mucous membrane and the teeth in a state of healthy equilibrium by overcoming the above enumerated morbific processes. Nature has instituted protective measures of her own to accomplish the desired end. The normal mouth is fairly well protected against the continual onslaughts of the omnipresent bacteria through an unusually

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rich blood supply of the oral tissues, a high resistance of their epithelial lining, and a free flow of saliva. The vigorous use of the organs of mastication during the chewing of properly selected food will bring about an active circulation and stimulation of the parts involved, and, as a sequence, a rich flow of saliva required for the washing away of food debris and for the preliminary digestion of carbohydrate food is always insured.

Human saliva represents the mixed secretions from the three pairs of salivary glands and the minute mucous glands distributed over the oral cavity. Saliva may be defined as being a weak solution of alkalies, as present in the body juices, more or less saturated with carbon dioxide. It contains, furthermore, several organic substances, among which mucin and the several ferments which accelerate the changes of starches into maltose; i. e., the hydrolysis of polysaccharides into soluble disaccharides. The ferments of human saliva are principally represented by the carbohydrate-splitting type; i. e., amylase (ptyalin) and maltase, although oxydase and catalase are always present in more or less variable quantities. The physiologic function of mucin consists in mechanically assisting the food bolus in its easy passage into the stomach and to protect the oral tissues against irritating substances.

The biologic laws governing the secretions of saliva are directly responsible for its composition, its quantity, and its influence on the digestion and, incidentally, on dental caries. Only the most fundamental facts concerning these biologic aspects can be touched upon at this moment. The secretion of saliva depends upon nervous impulses. The quantity of saliva secreted, that is, the rapidity of its flow, depends upon the physical nature of the irritant (foodstuffs). Psychic stimulation is of less importance in this connection. Incidentally, the composition of saliva depends very largely upon the rapidity of flow; i. e., its organic and inorganic contents are primarily the sequences as produced by the nature of the irritant. The irritant induces these changes, not merely in the oral mucous membranes, but also in those of the stomach. The latter seems to respond through the formation of hormones. Apparently, as has been shown experimentally by Pawlow and his pupils, saliva is a glandular secretion capable of adaptation. However, the fundamental basis of the secretion of saliva rests with the process of mastication. The degree and the manner of mastication accelerates or diminishes very materially the nature of the irritant. The much discussed alkalinity of saliva depends directly on its ash contents; the more ash the higher the alkalinity. With an increase of the rapidity of flow an increase of alkalinity is always observed. Alkalinity of saliva as determined by titration is always a "one man's" finding and not to be relied upon. To determine correctly the reaction of a fluid which as saliva, hovers so near the neutral point, the electrometric measurement of the H-ion concentration is the only permissible scientific method. The writer has successfully employed for such work the gas-chain apparatus as modified by Michaelis. The reaction of normal saliva; i. e., saliva collected during periods of physiologic rest of the salivary glands, is so very weakly alkaline that its influence as a so-called neutralizing medium of "acidity" of the mouth is practically nil. As the quality of saliva when collected during active digestion is always an expression of the nature of the last meal

taken, saliva intended for analysis should be collected during resting hours of the digestive apparatus. The normal, healthy, grown individual produces during waking hours approximately 1 c.c. of saliva per minute. During mastication, as stated above, depending upon the nature of the foodstuff, this amount may be greatly increased.

Pickerill has made the assertion that the principal function of saliva consists in the hydrolysis of starches and thus prevents dental caries. The writer has not been able experimentally in the human mouth to show any relationship between the amylase (ptyalin) cotent of saliva and dental caries. Amylase may be readily paralyzed or accelerated by many chemical agents. Pure amylase is inactive as a ferment; certain inorganic ions, especially the chlorine ion (sodium chloride), accelerates its activity ten times or more. Normal quantities, or even relatively large quantities of amylase may be, and occasionally are, present in the most rampant forms of caries. In certain animals, as for instance in the domestic dog, very little or no amylase is present in the saliva, although the dog is relatively immune to dental caries.

The much discussed bactericidal action of the saliva, which is claimed to be due to the presence of small and very variable quantities of potassium sulphocyanide, has been disproved by the classic researches of Miller, Bruylant, Gies and Kahn, and Kantorowicz. In a recent paper, McGehee attempts to revive the influence of sulphocyanide in its relation to the causation of dental caries, and, as a proof, he hypothetically quotes from Pauli's interesting little work: "Physical Chemistry in the Service of Medicine." McGehee has wholly missed his point. Dental caries does not depend on the living organism, and, as a consequence, the presence or absence of this chemical in metabolic processes as related to dental caries plays no part. In the normal mouth pathogenic microorganisms are usually less virulent, and they are the subordinates of the saprophytic types. Fluegge has shown that the pathogenic bacteria will become extremely active if the individual is afflicted with a slight local disturbance—as a simple catarrh of the throat. Claermont has expressed similar views, and, after a careful study of the fluids of the mouth, he asserts that one is not justified in stating that saliva possesses any definite bactericidal action. It seems, however, that the parotid saliva of man and of some animals (especially the goat) exercises an inhibitory function on certain microorganisms—the staphylococci and the streptococcci.

Very recently an hypothesis relative to definite defensive or protective organisms possessed or produced by nature to combat the ravages of dental caries has been promulgated by McGehee. This conception is based on the ingenious experimental researches of Abderhalden, who holds the view that diseased processes are primarily regulated by defensive ferments. McGehee's conception is based on a misinterpretation of the Abderhalden theory. As I stated above and wish to state again, dental caries is not a disease; it is a process of putrefaction, which may occur in a tooth, whether this tooth forms a part of the anatomy as a whole, or whether it is detached therefrom. The writer, two years ago, while working on this very question in Abderhalden's former laboratory at the University of Berlin, convinced himself of the fact that defensive ferments, in the

sense of Abderhalden's protective theory, play no part in the process of dental caries.

The fermentative changes of the various types of saccharides into soluble sugars, the mechanical washing away of accumulated food debris, and the ability of biologically inhibiting the virulence of pathogenic bacteria, are the important functions performed by a freely flowing saliva, and thereby maintain the physiologic equilibrium of the oral cavity.

Immunity to dental decay, in the writer's opinion, depends—*cæteris paribus*—first, on a tooth free from imperfections of calcification, and, second, in a freely flowing saliva.

Immunity as referred to tooth structure is, in the strict sense of the word, a misnomer, as it is not bound up with vital phenomena. In a biologic sense, immunity indicates a state in which the "living" body resists disease. In a pulpless tooth, it goes without saying that we are dealing with dead structures so far as the enamel is concerned, and it is this latter tissue only that concerns us in the elucidation of the question: How do teeth decay? In a tooth with a vital pulp, the writer holds the view that enamel is capable of carrying on metabolic processes to a limited degree. He is able to substantiate this claim by certain pharmacologic reactions, which, however, he can not discuss at this moment. The surface of so-called living enamel he regards practically as dead structure which offers no vital resistance to the physicochemical process of decay. The omnipresent surface colloids and the colloidal fluids present in the enamel in teeth with living pulps modify the process of decay. All teeth which are imperfectly calcified on account of their lowered resistance will sooner or later decay until relative immunity is established in accordance with the imperative law of survival of the fittest. If, however, the flow of saliva is impaired or completely checked, all teeth will be destroyed by caries unless some other means for the removal of food debris is established. The rapidity of the destructive processes is proportionally dependent upon the severity of the impairment. Normally, the flow of saliva is regulated by the intensity of the irritant as evinced during mastication. The stimulation by acids is of a temporary nature only, and of less importance. Therefore, vigorous mastication, or, as it is called by a recently popularized term, fletcherizing, of correctly selected foodstuffs forms the basis for the natural prevention of dental decay.

To substantiate our contention relative to the position which saliva occupies in the prevention of caries, we may cite a few examples. In xerostomia, i. e., inhibition of secretion of saliva, the teeth will begin to crumble away with the onset of the dry mouth. During other temporary pathologic disturbances of glandular activity, i. e., continuous fevers (typhoid), menopause, diabetes, etc., clinically a marked increase of dental caries is always observed. The change of environments of food supply, i. e., if the natural struggle for existence in gathering food is supplanted by artificially furnished food of a prepared type, a marked preponderance of dental caries, even in hitherto immune herbivorous animals, is always observed, as, for instance, in monkeys in captivity. The skulls of wild horses very rarely show carious defects; the domesticated horse is in frequent need of the veterinary dentist. Subjecting wild tribes of the human race to the influences of civilization, and, as a sequence, changed food supplies, will always

be followed by a most marked increase in dental caries. Immigrants from countries where hard-baked, black bread forms a large part of their staple diet, when coming to the United States are frequently subjected to intense ravages of dental decay. For instance, newly arrived Scandinavians, accustomed to chewing "knackebrod," forget to masticate our soft wheat bread, and, as they are often forgetful of the blessings of the toothbrush, rampant decay is frequently manifest within a few months after landing. Dental caries is comparatively rarely observed in the teeth of habitual tobacco chewers. Miller and others have demonstrated that tobacco juice possesses no antiseptic action. Its prophylactic effect, as far as the teeth are concerned, rests with the pharmacologic action of tobacco, i. e., its alkaloid, nicotine, is a powerful salivary stimulant.

In a recent communication *(Dental Cosmos,* 1913, p. 1081), Pickerill tentatively admits the importance of the quantity of salivary secretion. He states: "I would even suggest that caries of the teeth may be regarded as a symptom of failure of the nervous mechanism controlling salivary secretions to functionate normally." In the writer's opinion, the quantity of the secreted saliva is the sole factor which governs environmental phenomena concerning tooth decay.

The quantity and, to a less extent, the quality of saliva, on account of our present methods of preparing and selecting foodstuffs and the consequent insufficient mastication, are frequently inadequate to bring about a proper physiologic cleansing of the oral cavity. To assist nature, suitable mechanical and chemical means may be employed to overcome this deficiency. The mechanical cleansing of the mouth and teeth by means of the brush, powder, paste, toothpick, floss silk, etc., constitutes the absolute fundamental principle of artificial oral hygiene. Food remnants and slimy adhesions between and upon the teeth, together with a large number of the adherent bacteria, are principally removed by mechanical cleansing. The mechanical cleansing of the oral cavity by these enumerated means may, however, be materially assisted by the judicious use of suitable mild astringent and indifferent antiseptic solutions. Powders, pastes, and washes containing soluble drugs, or drugs in solution, are employed for the avowed purposes of assisting nature in accomplishing the desired means to an end, i. e., they must favor the recovery of an inflamed mucous membrane, and they must mechanically remove accumulated food debris.

A good oral preparation should possess the following properties:

(1) It must be absolutely indifferent in regard to:
  (a) The mucous membrane—noncaustic.
  (b) The teeth—nondecalcifying (mechanical or chemical).
  (c) The organism as a whole—nonpoisonous.

(2) It must not interfere with the normal physiologic cleansing of that oral cavity; i. e.,
  (a) It must not inhibit the secretion of saliva;
  (b) It must not perceptibly alter the reaction of saliva;
  (c) It must not destroy the ferments of saliva.

(3) It must possess sufficient cleansing action, combined with

(4) Good taste and odor.

These various enumerated properties are naturally rarely found in combination in a single oral preparation, and yet each one is of great importance.

Hygienic measures as applied to the oral cavity are practiced in proportion to the pleasant sensation which they call forth, hence, a mouth preparation which has a disgusting taste is ineffective because it will not be employed for any length of time by the laity. The great mass of the public will never be induced to practice oral hygiene that involves ill-tasting preparations. As stated above, mouth preparations must be absolutely free from danger so far as the mucous membrane, the teeth, and the organism as a whole is concerned. Hence, Roese's dictum should be indelibly fixed in the mind of every dental and medical practitioner: "The importance of oral antisepsis is not so great that we are justified in assuming the slightest risk." This statement can not be emphasized too strongly in view of the fact that numberless mouth washes and tooth preparations of questionable character are continuously forced on the market. Unless the correct composition of a ready-made mouth or tooth preparation is known, it should not be recommended.

The majority of the so-called dental preparations which are employed by the laity for daily use belong to a group of medicinal compounds generically known as proprietary preparations. As these compounds are not used for the avowed purpose of curing a specific disease, but rather as hygienic measures, no objection can be raised from an ethical point of view, provided that they are prepared from approved formulæ and that they conform to the claims as outlined above.

A few of the more widely advertised preparations which are apparently universally recommended by the profession deserve special notice. Bad taste and general unfitness for the purpose in view are the lesser evils of most of these preparations; some are distinctly dangerous to the oral tissues when employed for daily use. The conception that mouth washes, tooth powders, and pastes which, in general, are nonpoisonous and neutral in reaction are indifferent to the oral tissues is erroneous. Many of these highly extolled compounds sail under dubious flags. For instance, an alkaline thymolated glycerine solution is claimed to possess extraordinary qualities as an oral antiseptic, while, in reality, it is about equally effective as a physiologic salt solution, but with a less pleasant taste. A 50 per cent potassium chlorate tooth paste at one time furnished "Nature's antiseptic—free oxygen—which whitens the teeth," and, while at present it cures "acid mouth," no trace of free oxygen was ever obtained from the use of this paste. The distinctive danger of potassium chlorate to the general health is, of course, not mentioned. Again, a mentholated salol solution is much lauded as "the most persistent oral antiseptic." This compound is rather prone to produce persistent eczematous eruptions about the corners of the mouth. Most of the widely advertised tooth powders, pastes, and certain mouth washes contain too high percentages of soap. Soap, on account of its alkalinity, invariably kills the important salivary ferments. The list of ill-constructed mouth preparations may be extended *ad libitum*. In spite of the absurd claims made by the manufacturers, it seems incomprehensible that numerous practitioners recommend such compounds to their patients. The best service that a conscientious practitioner

can render to his clientele is to absolutely prohibit the use of a mouth preparation of whose innocuousness he is not fully convinced.

The search for so-called tartar solvents as an addition to tooth preparations—substances which prevent or dissolve calcareous deposits about the teeth—has occupied the minds of the dental hygienists for some time past. The chemical nature of the oral calculus indicates that the logical solvent should be an acid or an acid salt. For plausible reasons, such substances can not be utilized in the mouth with impunity. It is known, however, that certain alkalies—the salines—prevent the ready formation of calculi, and they help to remove fresh deposits when brought in intimate contact therewith. Just how much of this destruction or removal should be attributed to the mechanical scrubbing of the brush, and how much to the solvent action of the ingredients of the tooth powder or paste, is not known at present. Nevertheless, the salts of certain mineral springs, especially those of Carlsbad, are used in concentrated form for such purposes, and apparently with some success. Artificial Carlsbad salts may be incorporated into a paste with calcium carbonate and other abrasives; its only drawback is its disagreeable salty taste. Tooth pastes containing about 25 per cent Carlsbad salt may be obtained in the market.

Innumerable experiments have been made to determine the so-called antiseptic strength of oral preparations. As a standard, the Rideal-Walker phenol coefficient or some other laboratory standard is usually employed as a means of arriving at some tangible conclusions. If these experiments are carried out in test tubes with cultures of isolated organisms, comparative deductions drawn from such tests are wholly unwarranted as they do not portray actual conditions existing in the oral cavity because the very premises upon which these experiments are based are erroneously chosen. On the other hand, if these preparations are tested directly in the mouths of normal individuals, it is invariably found that, in average, only 50 per cent of the oral bacterial flora is inhibited. Authorities agree that it is impossible to render the oral cavity sterile, even for a short period only, with any of the so far known antiseptic solutions (pastes, powders, etc., must enter into solution if any antiseptic effect is to be expected) in the strength in which these solutions can be employed with safety. The dilution of these preparations and the short time allowed for their action in the oral cavity as actually employed by the user, necessarily minimizes their antiseptic effect to such an extent as to practically render the solutions inert.

Recently, Gies has advocated diluted vinegar, and Pickerill, a solution of acid potassium tartrate as being most efficacious mouth washes. Both recommendations are based on observations made in the laboratory; their correctness is not substantiated by clinical evidence. The recommendation of an acid mouth wash of the above type is based on wrong premises because, first, the laity will not be induced to employ an ill-tasting mouth wash for any length of time, and, second, the pharmacologic principle evolved in the selection of such solutions is erroneously applied. When an acid mouth wash in the form of vinegar or acid potassium tartrate is taken in the mouth, a temporary copious flow of alkaline saliva, rich in mucin, is produced. This alkaline saliva serves as a diluent and neutralizer of the acid and the colloidal mucin acts as a protector of the

insulted mucous membrane and the teeth—Nature's method of getting rid of the irritant. In accordance with Heidenhain's law, forcible stimulation of salivary glands is followed by impairment of their function. Incidentally, the acidity of these solutions kills the important salivary ferments. It has been repeatedly shown, that a physiologic salt solution (approximately one dram of sodium chloride to a pint of boiled water) heated to a body temperature, reduces the oral flora by 50 per cent and, incidentally, it is absolutely safe. On the other hand clinical evidence seems to point to the beneficial effects which are obtained by the use of such milked alkaline astringents as well diluted lime water. E. Kells, Jr., Kirk, and many other observers have repeatedly called attention to the remarkably good results obtained by its continuous use. Its therapeutic effect depends on its solvent power of the mucin deposits on and about the teeth, which mechanically retain food debris and bacteria and on the formation of insoluble soaps with fatty acids and lipoid substances. Incidentally, the freshly precipitated calcium carbonate may possibly exert some mechanical protective influences on the teeth themselves. When employed in proper dilutions, its mild astringent effect favors the recovery of inflamed mucous surfaces which, to a mild degree, are almost universally present in the mouths of most persons. A tablespoonful (one-half ounce) of lime water added to a tumblerful (eight ounces) of physiologic salt solution makes a most serviceable mixture which may be used as a mouth wash with impunity. Incidentally, this solution corresponds more closely to an artificial saliva—Nature's protector of the teeth, than any other mouth wash found in the market.

I have made innumerable tests with the various dental preparations as found in the market and with experimental mixtures, by plating out specific quantities used within specific times in the oral cavity and counting the number of colonies before and after these tests. These experiments merely verify what has been stated above, namely:

1. Sterilization of the oral cavity with any of the commercial dental preparations or any antiseptic, in the strength in which it can be employed with safety, can not be accomplished.

2. The cleansing of the oral cavity with an antiseptic solution alone or combined with the mechanical effects of the toothbrush, powder, or paste, reduces the number of oral bacteria approximately about 50 per cent. The claims made for the antiseptic strength of certain commercial preparations are, by actual tests, wholly unwarranted.

3. A physiologic salt solution of body temperature in conjunction with the toothbrush and precipitated calcium carbonate in the form of a powder or a paste (providing these preparations are in conformity with the claims as outlined above) is the safest and most efficient of all so far known, artificial, oral hygienic measures.

CONSTITUTIONAL DISEASES IN INFANCY AND DENTITION*

By G. Lippmann, M.D., St. Louis, Mo.

I DEEM it a great privilege to appear before you today as a representative of a specialty that is, like yours, deeply concerned with the welfare of the young. It is only a short time since we have learned to realize the necessity of the different interests in medicine meeting together, a neglect not only detrimental to the followers of the profession, but also to suffering mankind. Those combined meetings must of necessity develop the curative side, as well as the preventative, of our science.

You all know what has been done in a prophylactic way in the prevention of infant mortality, a result, that was only made possible, by putting the feeding of the very young infant on a scientific basis. But to keep infants alive could not for a long time be the only aim of the new science of pediatrics. Its aim had to become the rearing of *healthy* human beings.

The close interrelation between the process of dentition and the health of the child, between mastication and growth, has not received sufficient consideration. We have only a short time ago rescued this absolutely normal physiologic process of cutting teeth from a mire of superstition. What innumerable symptoms were not ascribed to this act! We know today that this has little or no effect on the well-being of the infant; but now since we are fully convinced of the harmlessness of the process of the appearance of the teeth, we have learned more and more to recognize the importance that is attached to the preservation of healthy instruments of mastication and of their normal juxtaposition and contraposition.

To know how to prevent the now so prevalent dental caries and malocclusion demands that we look carefully into the scientific cause of these pathologic conditions. The fact can not be too strongly emphasized that there is no evidence that will bear scientific investigation that the teeth of this age are congenitally not as strong, or, better said, as normal, as those of our forefathers. The prevalence of dental disorders must, therefore, be looked for, not in a change of the character of the teeth themselves, but in the malign influences to which they are subjected. Fortunately the indestructibility of these tissues enables us to compare them with those of our ancestors.

We find that only a few generations ago dental caries was almost nonexistent or at least rare, while during the last fifty years caries and pyorrhea have become so prevalent that a good set of teeth is looked upon as marvelous. We know that among the Maoris of New Zealand, so long as they existed on native diet, caries was found only in one per cent; but after seventy years of more or less civilization, this condition occurs in about ninety-five per cent of Maori children. Living under European influence produced a change which coincides with that prevalent under the full influence of modern western environment.

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This ought to and really does give us a perfect clue to the right direction which we must follow in the rearing of normal children. The child has the undisputable right to demand feeding from the mother. Cows' milk is the food for calves; human milk for human beings. But this is not the only point to be considered; we must appreciate the fact that the act of taking nourishment from the breast differs from that of sucking from a rubber nipple. The emptying of the mammary gland calls for an increased muscular activity on the part of the infant, so that the alveolar arches become more fully developed. The high roofed palate and narrow arch is of rare occurrence in children that are breast fed for the first eight or ten months of life. The quality of the teeth also depends on the supply of natural food. The teeth of breast-fed children are much better calcified than the teeth of children reared on cows' milk. So marked is the difference in the structure of the teeth that we can pick the child that has been breast-fed. At the age of eight to ten months the time of weaning has arrived and contemporaneously the incisors appear. These implements of gnawing surely have a purpose. Is milk still to be the only means of sustenance to be given to this child? Most assuredly not. What is the usual diet ordered now? We prescribe a mixture of milk with mush or toast, sweetened, soup, mashed potatoes, and vegetables run through a collender. Is that the diet aborigines give to their children? The infant, when teething, likes to bite on something hard; by instinct, he tries to get nourishment from a hard substance. Milk, of course, must be given to the child, but the carbohydrates should be supplied in the form of hard toast or stale bread. Later on, when the molars have made their appearance, a food should be given that necessitates grinding and milling.

If only a finely divided food is offered, the child will bolt its food and will grumble if it has to chew. It is hardly necessary to mention here in condemnatory terms the deleterious custom of giving soft sweetmeat at the end of the meal. The meal should be concluded by the chewing of a piece of hard toast and, if possible, followed by fresh fruit, especially a slice of orange. This enforced mastication will not only do more in the prevention of caries than the most careful use of the toothbrush, but will show its good effects in another direction. The biting on hard substances must of necessity promote the development of the jaws and must produce larger arches for the teeth. With a better arch the high roofed palate can not occur so frequently. While this would undoubtedly permit a freer passage of air through the anterior nares, a full working of the muscles of mastication, owing to their attachment, would also tend strongly to widen the posterior openings of these parts. The distinct tendency to an inadequacy of the nasal passages might be overcome by a rational method of infant feeding.

It has been remarked before that almost any infant reared on cows' milk shows the consequences of it in susceptibility to dental caries. We pediatricians recognize three classes of infants in relation to cows' milk feeding. A comparatively small number of infants *can not* be reared on cows' milk *at all.* The second type *can* be reared on cows' milk, and the third *may be* reared on this food only with great difficulty. Let me assure you that if the last class were a very numerous one, the graveyards would not be filled with the corpses of the very young.

The frequent disturbances in the growth of the child caused by the unnatural character of the food accounts for the retardation of bone and tooth formation and a decrease in their resistance.

Furthermore, we should mention two important congenital dispositions to disorder or disease; first, the rachitic diathesis, and, secondly, the exudative diathesis. Both play a very important role in producing dental disturbances, caries as well as malocclusion. I do not intend to go deeply into the pathology of rickets, but will simply mention the fact that in rickets the young bone tissue does not calcify sufficiently or sometimes not at all. Bones that were fully developed lose their lime salts during the course of the disease. Dentition is of necessity strongly influenced. The first teeth do not begin to appear at the regular, expected time; a delay occurs that sometimes puts the appearance of the first tooth off to the beginning of the third year. The interval between the cutting of the teeth is prolonged. Dentition may come in the most irregular way. The incisors of the upper jaw are usually very small, soft, and friable. They show a greenish discoloration and are almost always susceptible to caries, a caries that sometimes completely amputates the tooth. The formation of tartar is excessive. The temporary teeth are frequently eroded around the neck and roots, while the permanent teeth, already damaged before their appearance, show also erosions on the body and the cutting edge. Of especial interest to the orthodontist are the malformations caused in the jaws by this disease. The lower jaw is shortened in the sagital direction, causing what is technically called the trapeze form of the lower jaw. The upper jaw is lengthened in the frontal direction, producing a lyra form. The lower alveolar processes show a tendency to turn in; the upper alveolar processes, a tendency to turn out; thus creating the picture of malocclusion so well known to all.

This is the picture of the damage done by this disease in so far as it is of especial interest to the followers of the dental science. Of the harm caused to osseous system in general, and of its destructive influence on the child as a whole, I do not want to discourse here; suffice it to say that it is absolutely necessary to be able to diagnose rickets in its very beginning, before permanent malformations occur. The symptomatology of early rickets is as follows:

A child that has always been lively shows less vigor and cries easily. It buries its head into the mattress or pillow and moves it from side to side until the occiput becomes bald. During sleep it perspires so freely around the head that the pillow shows the mark of the perspiration. Characteristic of this sweat is its stickiness and its peculiar sour odor. While these early symptoms prevail, no change on the osseous system has taken place, they only occur weeks afterwards. The time for interference is clearly indicated, and while we are not in possession of the absolute knowledge of the pathogenesis of the disease, while one theory chases the other as to the cause of rickets, we are well able to deal with it in a curative manner. Fresh air, massage, exercises, and baths are indicated to improve the general condition. This combined with the internal use of phosphor codliver oil is an absolutely sure way to overcome this malady and prevent all its consequences.

Let us now see to what extent the other diathesis, the exudative diathesis,

should be of interest to you. The exudative diathesis derives its name from the tendency of the patient to exude easily from the skin and the mucous membrane. The primary disturbances of the skin consist in the appearance of brownish black, adherent spots on the hairy part of the scalp. The skin of the cheeks is reddened and thickened. Behind the ears we may find an intertrigo, an oozing skinfold, very resistant to treatment. The tongue shows the characteristic picture of the so-called geographical tongue, which is produced by exudations on its surface with an increased prominence of the papillæ, the white spots being caused by a peeling off of the epithelium. Of greater importance than those changes occurring on the outer skin, are those connected with the upper air passages. The tonsils and adenoids are enlarged. It would be carrying coals to Newcastle, were I, as a physician, to speak to you of the influence of mouth-breathing on the correct occlusion of the teeth. Here as in rickets we are in darkness as to its pathogenesis, but we do know how to prevent this symptom-complex from doing permanent injury to the young infant. The cure rests solely on the diet prescribed. The regime must be so arranged that an accumulation of adipose tissue on the part of the child is prevented. The weight of the patient must be kept in certain limits, without, of course, weakening him.

I can not conclude these short remarks without mentioning one more specific pathologic entity that exerts at times a pronounced influence on the teeth, and that is syphilis. With a disease so fully known to science as lues, and with the profession in the possession of a cure, if there be a cure in medicine, there is hardly any excuse for its harmful after-effects. In speaking of the teeth in connection with this disease, we have to mention here the name of the famous English clinician, Hutchinson, who first carefully studied and described the changes produced by syphilis on the teeth. Let me advise you to follow his careful description closely. "The upper middle incisors show on their cutting edge a half-moon-like concave tissue loss, and frequently, though not always, the dentin becomes visible. The teeth are barrel-shaped." I mention this classical description here because only too frequently the diagnosis of lues is made by mistaking the inroads made by rickets for those made by syphilis.

CONCLUSIONS

1. Dental caries, being a disease of civilization, does not rest on congenital lack of resistance. The cause must be looked for in injudicious feeding.

2. The rachitic and exudative diatheses must be counted among the causative agents of dental malocclusion and caries.

3. The influence of syphilis on the teeth is of comparatively minor importance.

DISCUSSION ON THE PAPERS OF DR. PRINZ AND DR. LIPPMANN

Dr. Prinz.—Dr. Lippmann has set forth the causes which are predisposing to dental caries. There is no question in my mind and apparently in his mind that the sole factor of a boy's health, so far as the teeth themselves are concerned, is the underlying factor in regard to the so-called predisposition of these particular teeth to decay. Remember, there is one important fact, that the teeth, as such, have no bearing upon the anatomy as a whole. Decay of the teeth is not a disease in the true sense of the word, as we understand it, and from a general biologic point of view. A tooth, whether it is taken as a whole or removed, attached to a rubber plate as an artificial substitute in this particular mouth, will always decay. It decays from its predisposition. Therefore, internal medication for the purpose of overcoming or limiting so-called predisposition to caries is wrong. It has no bearing on the subject whatsoever. It is solely a question of diet. Naturally the protection of the oral cavity depends upon the quantity of saliva, and the quantity of saliva, as Dr. Lippmann has shown distinctly, depends upon the physiologic processes of mastication. Saliva, as such, from the viewpoint of the biologist is not a question of alkaline or acid fluid which preserves or destroys the teeth. The quantity of saliva produced and its chemical reaction are due to the fact that the nutrition which we put inside of our patients calls for that specific reaction that we find. Certain foodstuffs do not call for the production of saliva at all. To reestablish, for instance, an artificial salivary fistula, we feed an animal such things as milk, and no increase of saliva occurs. On the other hand, if you put into its mouth any substance which is boiling, as, for instance, ripe meat, it has profuse flow of saliva.

It is stated and frequently quoted in dental circles that the dog usually does not suffer from dental caries; he suffers from pyorrhea and loss of teeth, but dental caries are comparatively rarely met with. Please understand that a dog in his make-up is totally different from the human being. He is primarily a carnivorous animal; he swallows his food. If we make an analysis of the saliva of the dog we do not find ptyalin, and some men say that ptyalin is what controls saliva. If we take a domestic dog and feed him for a week on pure carbohydrates, we find that we can produce ptyalin and amylase; that the gland which produces saliva has adapted itself to conditions. It is said there are certain kinds of decay where we meet with so-called immunity, and then again we meet with a pronounced predisposition to decay during the life cycle. We can always trace an apparent immunity or an apparent predisposition or disturbed immunity to glandular changes, to inactivity of the glands. I have mentioned the fact that in prolonged cases of typhoid fever, we find a predisposition to decay of the teeth simply because we have incidentally glandular impairment. In the peculiar disease known as osteomalacia the teeth melt away like snow before the sun because there is no flow of saliva. Saliva primarily protects the bony structure of the oral cavity which we refer to as the teeth. A free flow of saliva is the sequence of powerful normal mastication.

Dr. Lippmann has referred to the teeth of Maori children. He said that in a normal state there was not more than one per cent of decay, but living under civilized conditions pronounced decay of the teeth has taken place as is manifestly shown. This is not due to the fact that there is a difference in the make-up of the tooth structure, but it is due to the fact that the Maori child is fed on things which are contrary to its nature, contrary to what nature intended, and we find also in animals kept in captivity pronounced and distinct liability to dental caries because they live under conditions where they do not have to fight for their food. That is an important factor.

As to the therapeutic value of dental preparations, I have nothing more to say than what I have already said.

Dr. B. E. Lischer.—I am frank to confess that I am unable to discuss these two able papers as I should like to discuss them, but I believe I express the sentiments of every member present when I say to the essayists that we are very thankful to you for your contributions to our program and your participation in our meeting.

I merely wish to emphasize the fact that Dr. Prinz concludes that a solution of sodium chloride and a harmless powder which will act as a mechanical cleanser are, after all, the best agents for daily use by the patient. And since he has presented his arguments so thoroughly, I feel that his seemingly simple conclusions represent considerable value and progress.

Most of the children that come to us for the treatment of their oral deformities are,

as a rule, in a state of health. But we frequently meet with cases that do not respond to treatment as readily as we expect. Now, I would like to ask Dr. Lippmann if some of these patients suffer, to a greater or less extent, from some of the conditions he has outlined for us today. In other words, is has often seemed to me that some of our patients ought to be under the care of a physician for the correction of some underlying condition; be that rickets, the exudative diathesis, or congenital lues.

Dr. Sullivan.—I would like to hear some remarks from Dr. Lippmann on the influence of tuberculosis and kindred diseases on dentition.

Dr. B. W. Weinberger.—I appreciate the paper of Dr. Prinz and especially the one presented by Dr. Lippmann. It only bears out some of the contentions I tried to bring before you yesterday, and among them, that there is such a thing as I pointed out in my paper expressed in general conditions. Most of the skulls which were shown were of a rachitic nature.

There is one point I am sorry Dr. Lippmann did not touch upon, namely, the influence of the effects of internal secretions on the development of the tooth, dentition, and so on. That is a question we have to consider immediately. It is the one question that is causing all sorts of trouble. We hardly realize it. We are only beginning to find out here and there a few points that show conclusively that it is one step that we have to investigate. Naturally these conditions are met by men who are intimately in contact with them, and it is up to them more than it is to men engaged in our profession to help us along in this way.

I would like to ask Dr. Lippmann what he has found with regard to the internal secretions, outside of the rachitic condition, how congenital these cases are, and the possibility of these conditions being present at birth, preventing the proper nourishment of the children, due to the extreme distal and posterior relations of the mandible. If he has had any experience with any of these cases, I am sure we would all like to hear it.

Dr. G. Lippmann.—The question asked by Dr. Lischer I will answer later when I take up the questions of Dr. Weinberger.

One gentleman (Dr. Sullivan) inquired as to the influence of tuberculosis and kindred diseases on dentition. Dr. Prinz has answered that in speaking of typhoid fever. Whenever you have a lowering of the pulse tension you surely have a reason for the development of dental caries or dental destruction.

Reference was made to a faulty condition of the osseous system in children with rickets, and also to stories told by the mothers. To make a diagnosis of rickets in after life, it is necessary to ask three questions. First: Do you remember whether the baby perspired around the head when it slept? The mother does not think anything of that. She answers yes. Second: At what age did the baby begin to walk? Third: When did dentition actually occur? What teeth came in first? In what rotation did the teeth appear? If you can get these three questions answered, you can make a diagnosis of rickets in after life. The harm done to the osseous system is shown by the knock-kneedness and bow-leggedness of the child and by the peculiar formation of the head, the brow of Jupiter, the protruding frontal bones, and a somewhat flat upper appearance of the skull will tell you that the child has rickets. Of coarse, rickets appears early enough in life not to do any permanent harm if it is cured. The harm done by rickets is not only done by the first teeth, but done to the permanent teeth, so that caries is one thing that occurs in the second teeth in the rickety human being, and also the malformations I spoke of, a tilting of the upper arch and a tilting of the lower arch.

We do not know the cause of rickets.

As to the question of breast-fed children. Almost all mothers can feed their babies at the breast if they are handled correctly. There is no guaranty that milk must come in three days or ten days, but the milk will come if the mother is persistent. There is no difference in the quality of milk of the mother.

Dr. Prinz spoke of the use of certain therapeutic preparations and about chemical analysis. You can not make a chemical analysis of milk percentage in the breast of a human being, because you can not empty the mammary glands. Every farmer will tell you that the first stripping of the milk looks blue. That is always the case. The last part that is taken away from the mammary glands is the cream, so that when the doctor speaks of having a chemical analysis made of the milk you know right away it can not be done. In the first place, much depends upon the milker of the mammary glands. The mammary gland can not be emptied artificially. In the second place, it is not clear that it is the chemical quality of the milk that makes a difference in the feeding of the child. We have gone to the period of percentage feeding in trying to make cows' milk equal to human milk

by percentage. We find we have not touched the physiologic principle of it, besides the salt principle in the two milks. Breast-feeding can be instituted in almost every case, and the child that is not breast-fed is handicapped.

Let us now take up the question of rickets in relation to the internal secretions. We today, as I said in my paper, do not know any reason for rickets, yet it is a peculiar condition. In England, where the milk is poor, rickets is produced by lack of fat in foods. On the continent, where the milk is fairly rich, rickets is produced by too much carbohydrates. In America, where we have raw milk, it is produced by boiling the milk or by artificial foods. This symptom-complex I called a diathesis; I did not call it a disease. It is a symptom-complex we do not know, but it may be produced by congenital disturbances of the internal secretion, and especially the secretion of the adrenal bodies and parathyroid gland. Let us go a little deeper into that, as possibly it may be interesting. I would like to say that those men engaged in your line of work in looking for congenital malocclusions and other pathologic conditions are not satisfied with taking pictures of the skull only. The question arises: Is rickets a congenital predisposition, an exudative diathesis produced by imperfect secretion of the adrenals and parathyroid bodies? We must take a picture of the long bones together with the head in order to make a diagnosis.

In rickets children who have gastric disturbance will suddenly develop spasms, or they will develop a spasm of the larynx that is accompanied by a crowing sound. The child gets blue in the face. These children are susceptible to spasms, they are rickety in all probability, and the spasm is produced by a disturbance in the parathyroid bodies and by a disturbance in the calcium metabolism. If the calcium metabolism is disturbed, and there is a disturbance in the adrenals and parathyroid bodies, we can see why the teeth should be disturbed by rickets. Besides giving phosphorus for combining the calcium, we can see why we should get results in these cases if we give children adrenalin internally and extract of the parathyroid bodies. Besides, if children susceptible to spasms are given repeated doses, they will not get a second spasm if fed calcium chloride or calcium lactate. This may give you an idea of how to overcome the ravages of early disturbed metabolism by feeding any one of the calcium salts.

Another interesting question comes up here about the internal secretion, and that is a question of abnormal position of the teeth in an abnormal mandible, especially with widening intervals between the teeth and with small teeth at the same time. I have put these cases down as low myxedematous cases, where there is a lack of thyroid and these cases improve under thyroid treatment. I did not quite understand Dr. Lischer's question.

Dr. Lischer.—May not some of these children go to the orthodontist without being under the care of a physician?

Dr. Lippmann.—In the first place, it is important to make a diagnosis of late rickets, which is not so rare as you think; second, the diagnosis of very light cases of myxedema; third, those cases that are still suffering from injudicious feeding at an older age. If you get results in your cases of malocclusion, you are fairly safe in giving small doses of thyroids to help the normal position of the teeth and normal growth with calcium metabolism. These old cases of rickets improve under thyroid, adrenalin, or calcium chloride treatment

The question of feeding is a hobby of mine. Feeding in infancy has to do with the weaning period. In nature sugar never appears as such except on two occasions, and that is honey, and in the sugar cane. Honey, of course, is not meant for food to any great extent. A child would have to chew pretty hard on sugar cane to get a small quantity of sugar, and in getting sugar would at least get sufficient saliva to wash the sugar down. In all our feeding we prescribe that a three-year-old child has to chew scraped beef, soft boiled eggs, mashed potatoes, vegetables, and so on. In addition, it receives gruel, porridge, nothing to eat, and the worst habit of all, besides not chewing, the child gets at the end of a meal a piece of soft candy so that it may not get hurt.

Dr. Prinz mentioned food. I spoke about Swedish bread. Most of the bread is whole rye bread and if toasted besides, it is a splendid means of overcoming the end of the meal.

Dr. Federspiel.—I am sure the Society appreciates the kindness of Dr. Prinz and Dr. Lippmann for presenting these two splendid papers. If we keep good records particularly of the teeth and take into consideration the systemic conditions and cooperate with the internists, we will accomplish more in the future than we have done in the past.

THE TEETH IN SORCERY AND MAGIC*

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FEW dentists have ever thought about or given consideration to the large place the teeth occupy in magic, sorcery, and folklore, to say nothing of a goodly mention they obtain in general literature. Since the earliest times and among all primitive races, teeth, especially human teeth, have occupied an important place in magic ceremonies, sorcery, incantations, the practice of magic, and the working of charms. The tribal magician, or medicine man, as he is better known in North America, would suffer considerable loss if he were denied the use of teeth in his practices. There is a new and particularly rich field to be explored by one who will interest himself or is interested in the curious historical toothlore which exists and is constantly being added to relating to primitive, savage, and barbarous peoples; nor are these apparently foolish and useless practices confined wholly to the primitive and barbarous peoples. We find remnants of magic practices existing much more generally than supposed among people of the highest civilization of which we boast and those people of the greatest culture. Nearly everyone is constantly in his daily acts doing little things as charms or wards of evil or exorations for luck who would scorn the implication that he was working the Black Art. Yet the same man feels a little elation, perhaps, and a sense of sublimnal satisfaction if he sees the new moon over his right shoulder. These lingering superstitions, which are dimly outlined, but no less indelibly fixed in almost every mind, are the remnants of the ancient tribal beliefs and ceremonies of our savage ancestors. They are mental survivals, long grown useless, which correspond to such physical survivals as the muscles in the ear, the appendix, the third molars, and others which persist to plague or puzzle humanity. Nor can it be said that culture or intellectuality frees one entirely from this form of mysterious influence, and among the more ignorant of our own citizenship, which is supposed to be the most enlightened in the world, they often amount to a baleful slavery. Long lists could be made of the personal superstitions of great men. Nearly every statesman, poet, philosopher, or scientist has in some small way, paid tribute to the long forgotten ceremonies, incantations, and beliefs of the Magi. We are no less the unconscious votaries of Black Art. Many is the farmer who carefully considers the phase of the moon when planting his crops. It would be an almost interminable task to catalogue the superstitions common to the daily lives of peoples of all lands and races. But we may refer to a few with which we are all familiar.

When you awake in the morning, you are apprehensive if you have dreamed about snakes or a dozen other things which are ominous. You are careful to put your right shoe on first, and if you sing before breakfast you cry before

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night. If you accidentally spill salt at the table, you quickly throw a pinch over your shoulder. If you take an umbrella from the rack and start to raise it in the house, there is a domestic tumult. Having left the house, if you should return for a forgotten article, you must sit down and count ten or your day will not be fortuitous. If a black cat runs across your path it is a sure sign of bad luck; and if you shudder, you know someone has walked over your grave, notwithstanding the fact that you are not yet a tenant of the narrow cell. If you meet a cross-eyed person, you must find a four leaf clover or some other talisman to remove the hoodoo. When you pay your car fare, you must be careful not to lose the buckeye you are carrying for your rheumatism or spend your lucky piece, to say nothing of the potato you used to carry before the lowly spud ranked as a gem. When you look at your time piece you toy for a moment with the rabbit's foot that adorns your watch chain. If you open your morning paper and should note that it is Friday, the thirteenth, you would certainly refrain from any new business adventure that day. If, when you step from the street car, you notice a three-pound horeshoe in the street, you will, of course, pick it up and lug it around all day. If there is a ladder leaning against the side of a building you are careful to walk around it. If there happens to be a hunchback in the elevator as you mount to your office, you will, of course, be careful to surreptitiously touch the hump. If an office friend gives you a knife or an ivory-handled paper cutter, you hand him a penny because the instrument is sharp and you must purchase it to avoid cutting friendship. Before going home in the afternoon you purchase an emerald for your wife because an opal is unlucky. When you step from the car and see the new moon over your right shoulder, you make a wish and turn over the silver in your pocket. Later you retire to sleep and let us hope to lucky dreams.

These are only a few of the superstitions that beset your daily routine. In all this we have made no reference to the teeth, yet, in the original causes of all these superstitions and customs, we find the teeth have played an important part.

Knocking out of certain teeth is practiced as a principal ceremony of initiation among certain eastern Australian tribes. It is also practiced by central tribes of the lonely continent, although not as an initiation rite. The hypothesis upon which they proceed is that, being a vital part of a man, a tooth sacrificed will help insure to him another life after death, and it is supposed that a tooth is chosen because of its well known durability compared with the corruptibility of other portions of the body. The extracted tooth is believed to remain in sympathetic connection with the man from whom it is removed. These extracted teeth were carefully cared for lest the former owner fall ill. With some tribes the mother of the lad initiated, according to custom, chose a young gum tree and inserted her son's teeth in the bark at the fork of the two utmost boughs. This tree was afterwards held sacred, and was made known only to certain persons of the tribe; but the youth himself was never permitted to know where the tree was. If the boy died, the tree was killed by fire. Other tribes would throw the teeth as far as possible in the direction the mother was supposed to have once camped. It was the custom of another Australian tribe to bury the teeth by the side of a pool for the purpose of stopping rain. When the teeth were

inserted in a bark of a tree near a river, or water hole, if the bark grew over the tooth or if the tooth fell into the water, all was well; but, if the ants ran over it the boy would suffer from a disease of the mouth. This is very clearly the origin of pyorrhea, which has been so long and laboriously searched for by our prominent bacteriologists!

Among the Murrang and other tribes of New South Wales, the extracted tooth was first taken by an old man and passed from one head-man to another, until finally it was returned to the boy's father and then to the lad himself. But in this journey it must on no account be placed in a bag containing other magic substances for that would endanger the young man. A man of the Murrang tribe traveled two hundred and fifty miles to fetch back some teeth because one of the boys, to whom they had belonged, had fallen into ill health, and the old man believed some injury had befallen the teeth. At other times the boy's father, or next of kin, would carefully bind up the teeth in emu feathers until after the mouth had healed. After this the teeth were treated in a magic manner in order to take the supposed life out of them. This interesting process consisted in the man making a low, rumbling noise without uttering any words, blowing two or three times with his mouth and jerking the teeth through his hand to some little distance. The teeth were then buried about eighteen inches under ground. Failure to do this would have made the boy liable to an ulcerated and wry mouth and ultimately to a distorted face.

For some curious reasons the Central Australian tribes generally associated the extraction of teeth with rain and water. In the Warramunga tribe they generally knocked out the teeth about the end of the wet season when they did not wish any more rain. The ceremony always took place on the banks of a water hole. When the natives of the York Peninsula in Queensland are preparing to knock out the young man's tooth, they mention the various districts which the relatives or parents of the young man have owned or frequented, and the name which is uttered at the instant the tooth flies out, is the country to which the lad is accredited as a citizen. This is an easy method of determining citizenship which sometimes might be used to advantage nowadays. Further, when the young man spits the blood out on the ground, the old men examine it to find trace of a likeness to some animal or plant, and the fancied likeness determines this man's totem.

A certain African tribe seems to be especially subject to lockjaw, and, in order to combat this distressing disease, they resort to a rather heroic preparedness by knocking out some of the teeth. The Malaysia think only people with good even teeth should plant maize, otherwise there will be empty spaces on the cob. Tribes in eastern Peru think that to carry the poison tooth of a serpent is a protection against the bite of a serpent, and their infallible remedy against toothache is to rub the face with the tooth. Some Brazilian Indians hang the teeth of an animal, called the grass-eater, around a girl's neck at puberty. What particular purpose that answers does not appear.

The ancient Greeks used to think they could dye their hair black with ravens' eggs; but while they were doing this, it was necessary to keep the mouth full of oil, otherwise the teeth also would be dyed black. The Galelarees think

when the teeth are being filed, you should keep spitting on a pebble, for this establishes a magic connection between you and the pebble. Henceforth your teeth will be hard and durable as stone. They also believe you should not comb a child's hair before teething, otherwise the teeth will be separated from each other. The Basutos carefully conceal their extracted teeth to keep them out of the hands of mythical beings called Baloi. There beings haunt graves, and if they found the teeth, they could injure the owner by working magic upon them.

There are still people in rural England who will not throw away children's cast teeth, believing if they were found and gnawed by an animal, the children would have teeth like that animal. They proved this by citing cases of supposed resemblance of certain human teeth to animal teeth. Upon the same principle, in other parts of the world, teeth are placed where they will be found by rats or mice in order that the former owner may have the fine teeth of these rodents.

In Germany there is a maxim which bids you put your tooth in a mouse's hole. To do so with a deciduous tooth, prevents the child from having toothache. Or you should go behind the stove, throw your tooth backwards over your head and say, "Mousie, give me your iron tooth; I will give you my bone tooth." If we were all careful to follow this simple formula, it would be wholly unnecessary to bother our heads about professional advancement. The German children also say, "Mousie, mousie, come out and bring me a new tooth;" or, "Mousie, I give you a little bone, give me a little stone;" or, "Mousie, there is an old tooth for you, make me a new one." This ceremony is believed in Bavaria, to insure that the teeth will be as white as the teeth of mice. The southern Slavonian children throw their teeth in the corner and say, "Mousie, there is a bone tooth, give me an iron tooth."

The Jewish children in southern Russia throw their teeth in the thatch roof with the same request to the mousie. You will notice the similarity in Raratonga in the Pacific, where the child offers the following prayer, when the tooth is extracted:

"Big rat! Little rat!
Here's my old tooth.
Pray give me a new one."

Then the tooth is thrown on the thatch of the home because the rats make their nests there. The rats have the strongest teeth known to those natives. A very similar ceremony is observed in the Sarangalas and Gorong Archipeligos. In the Kei Islands to the southwest of New Guinea, the child is lifted to the roof in order that he may deposit the tooth himself, with a similar invocation to the rats, with this difference—he requests a golden tooth instead.

The same custom exists in Mexico where the father believes if the tooth is not put in the mouse's hole there will be no new one issue from the gums. A more barbarous application of the same principle is the Swabian superstition that you should bite off the head of a living mouse when the child is teething and hang the head around the child's neck by a string, being careful not to make a knot in the string. This will make the teething easy. A very simple procedure indeed, but the Bohemians have improved upon it. They recommend

the use of a red string with the heads of three mice instead of one. We have noticed the widespread fame of the rat and mouse as a producer of sound teeth, a fact which has heretofore been overlooked by the gentlemen of our profession.

There are other animals that can lay claim to a portion of this distinction. The Singhalese invokes the squirrel. Again, in parts of Bohemia, the fox is asked for an iron tooth instead of a bone one. In Berlin the teeth of a fox are worn as a necklace around the throat, and make teething easy, as well as insure good and lasting teeth. The children of Victoria fasten to their wrists the tooth of a kangaroo with which they are to rub the gum. The Cherokee Indians supplicate the beaver to put a new tooth in their jaw. In Macedonia the child keeps his cast tooth for a while, then throws it at the roof and invokes the crow. It would seem the crow was poorly equipped to supply teeth of any kind, yet he is addressed as follows:

> "O dear crow, here is a tooth of bone,
> Take it and give me a tooth of iron instead."

The Thompson Indians of British Columbia hide the cast teeth of their children in raw venison and give it to the dog to eat, with the idea doubtless that this insures children strong, fine teeth such as the dog had. Mothers of Silesia frequently swallow their children's teeth in order to insure them against toothache and perhaps strengthen the weak teeth of children by the strong teeth of the adult.

In Central Australia, when a girl's tooth is knocked out as a ceremony, it is pounded up, the fragments placed in a piece of meat, and eaten by the girl's mother. When the same rite has been performed for a man, the pounded tooth must be eaten by his mother-in-law. The Arab boy throws his tooth towards the sun and asks for a tooth smooth and white like a hailstone. The peasant people of Lebanon say to the sun, "Sun, sun, take an ass's tooth and give me a deer's tooth."

There are many and curious empirical methods of treating and curing toothache. A piece of mistletoe hung around the neck is used in some parts of England as a remedy for toothache. Sometimes a double hazelnut is carried in the pocket as a ward against toothache. Another old English custom in case of toothache was to puncture the gum with a nail, then drive the nail into one of the roof beams, or rafters. This treatment not only cured a toothache, but insured against its recurrence ever after. To secure yourself from toothache you will be told in Sussex to be careful always to put on the right stocking before the left, and to put the right leg into trousers before the left. In Lancashire charmed belts or a cord around the loins is worn to ward off toothache. In other localities, a tooth taken from the mouth of a corpse is often enveloped in a little bag, and worn around the neck to secure the wearer against toothache. St. Appollonia was the chief recognized healer of toothache despite the incessant mention of St. Peter. At her martyrdom in Alexandria, under the Emperor Philip, her teeth were beaten out. Her emblems are, "Holding a tooth in pinchers. Her teeth pulled out. Pinchers in left hand; tooth in right. Pinchers alone. Tied to a pillar and scourged." St. Lucy also divides honors as the

patron saint against toothache. Without the least suggestion of irreverance, we frequently find the name of our Savior connected with what might appear to be tribal and Apocryphal legends in connection with the cure of sickness. There are many legends of this kind extant. Sometimes the legends are difficult either to explain or trace. This may be well illustrated by the charm for toothache which is popular among certain English peasants. One version runs—

"Christ pass'd by His brother's door,
Saw His brother lying on the floor.
What ailest thee, brother?
Pain in the teeth?
Thy teeth shall pain thee no more."

According to Artemidorus, the loss of a right or left tooth presages the death of a male or female relative.

In Lancashire the following is frequently worn sewn inside the waistcoat or stays, and over the left breast: "As Sant Peter sat at the geats of Jerusalm our Blessed Lord and Saviour Jesus Christ passed by and sead, what elsth thee? Hee sead, Lord my teeth ecketh. Hee sead, arise and follow mee, and thy teeth shall never eake eney mour."

There are some references to the teeth in the Bible, "The fathers have eaten sour grapes and the children's teeth are set on edge," but there seem to be more in the Talmud, according to which the teeth of foxes have the power to cause or prevent sleep. The teeth of a live fox would prevent sleep; the teeth of a dead fox produced sleep.

For much of the material in this paper I am indebted to Dr. J. G. Frazer and W. G. Black, as well as the late Dr. John J. R. Patrick.

DISCUSSION

Dr. R. Ottolengui.—I am a little bit handicapped in not having had a copy of this paper in advance, because, while I am not a magician myself I have read a number of works on the subject of magic and recall having seen many remedies in them for toothache. I was particularly interested in that part of the paper in which we find that a child who loses his deciduous teeth appeals to a rat or a mouse for one that is better. I believe that we can manage many children through their imagination, which, indeed is a part of the science known as child psychology. I had a little girl patient recently for whom I wished to extract a temporary tooth; she objected strenuously, so I said to her, "The tooth is very loose and will not hurt and after it is out I will fold it up for you in a nice clean envelope and you take it home and when you go to sleep tonight put it under your pillow; then when you wake up in the morning look under the pillow the very first thing and in place of the tooth you will find a nice new dollar." This attracted her attention at once, but it also attracted the attention of her father who was present and he remarked, "You have that wrong, Doctor; in our house a tooth put under the pillow changes into a dime, not a dollar." This remark on the part of the father interfered somewhat with my application of child psychology. This matter of child psychology is quite important, and while I believe that the most successful practice must come almost by intuition, still there are some good works on the subject that it would pay many of us to read. I was very pleased this winter to know that the girls who are studying to be hygienists in a school in New York City have regular lectures on child psychology by a specialist in this science.

Dealing with children, a great deal can be accomplished by appealing to their sense of personal esteem. As an example, I had two children under my care this winter, a sister

and brother. The boy was the older and was very nervous and apprehensive; whereas the younger, the girl, was quite phlegmatic. Almost anything that I attempted to do for the boy would be met by the query, "Will it hurt?" So finally I asked him, "What does that word 'hurt' mean?" He said, "Why, you know." But I assured him quite seriously that I did not know the word at all and I asked him if he thought he could show it to me in the dictionary. He at once offered to do so. My office assistant brought out the dictionary and the boy looked for the word. When he came to the place where it should be, to his surprise he found that the word had been cut out, and he remarked, "Why it isn't here, somebody has cut it out!" and I answered, "Yes we cut that word out long ago from our dictionary because we have no use for it in this office." Not wishing to be entirely outone, the boy said, "I am going to look for 'pain,'" and immediately turned to the P's. Fortunately for me, however, that had been cut out also. Still this did not entirely change his attitude of fear towards me; so one day I said to him, "Son, I can not tell from the way children dress now-a-days whether they are boys or girls. I have to decide sometimes by the way people act, and from the way you behave I sometimes think you must be a girl." He asked, "Why?" and I said "Because little girls always complain about everything, but boys never do, because boys know that they are nothing but little men and men never complain." Next time he came in I said to him, "Mollie, don't do that." He retorted, "My name isn't Mollie, it's Bill," and I answered, "You don't act a bit like a boy named Bill, so I thought you were a girl." The second or third day on which I called him Mollie he turned to me with a half grin on his face and said, "Doctor, I get you; go ahead with your work." I really borrowed that idea from the mother of another boy who began to be fidgety in the chair when his mother said to him, "Charles, are you a man or a mouse?" He replied at once, "I am a man, mother," and then turning to me added, "But wait a minute, Doctor, did you ever do anything like this before to a little fellow like me?" and I answered, "I have done it to boys much smaller than you and also to girls." At once he replied, "Then you can go ahead." Thus we can make use of psychology and lead the minds of children away from the notion of pain, but it is very necessary that you keep all of your promises and never promise what can not possibly be performed. It has long ago been pointed out by a good psychologist that mental anticipation plays a large part in realization; that is to say, if a patient anticipates or expects to be hurt, the slightest unpleasant sensation becomes real pain. On the other hand, if a patient is assured that he is not going to suffer, a little pain will only appeal to him as an unpleasant accident.

Dr. C. C. Allen.—A very curious thing in pursuing these studies is this, that very similar practices obtain in all parts of the earth, in places so far apart that we know that for many thousands of years the inhabitants could not have had communication with one another. Through all this there seems to be a common origin of superstition, and superstition is the beginning of knowledge. The very first professional man to be differentiated from the common laborer of all tribes was a magician, or, as we know him now, the priest or medicine man. He was set apart to do these things, and in the original scheme of things these men were the brightest of the tribes, and generally they were honest. They were not charlatans. Out of that came the professional man and the priest. Again, not all of them remained honest; they took advantage of those incantations and practices to deceive the people and to bring themselves into prominence and prosperity. But originally they started out as good men, and as Dr. Ottolengui said, while we may look upon these things as strange and foolish, in the days of long ago they were practiced honestly. I sometimes think in the ages to come, when the people on the earth look back upon some of our present practices, they will consider them as foolish as some of the things I have told you about. So we are not to make fun of these people. I do not feel I should do so myself. I thank you very kindly for your attention.

DEPARTMENT OF
DENTAL AND ORAL RADIOGRAPHY

JAMES DAVID McCOY, D.D.S., EDITOR
LOS ANGELES, CALIF.

SOME OBSERVATIONS CONCERNING THE REQUIREMENTS OF THE RADIOGRAPHER AND DESCRIPTIVE TERMINOLOGY

BY JAMES DAVID McCOY, D.D.S., LOS ANGELES, CALIF.

Professor of Orthodontia and Radiography, College of Dentistry, University of Southern California

WHEN William Conrad Roentgen announced his discovery to the world, he called it the *x-ray,* but the civilized world has for the most part seen fit to designate it the *roentgen ray* in honor of the discoverer. Roentgenology is, therefore, defined as "the study and practice of the roentgen ray, as it applies to medicine and surgery."

For purposes of study, roentgenology may be divided into two distinct fields, depending upon the purpose for which the roentgen ray is to be utilized. In the first, which is the one enlisting the interest of dentists, it is used for the production of shadow pictures or radiograms. In other words, it embraces what is commonly called the *field of radiography,* or *roentgenography.*

The other branch mentioned, includes the use of the roentgen ray for therapeutic purposes, and is known as *radiotherapy,* or *roentgenotherapy.* With this field, the dentist is happily not directly concerned, and, therefore, his responsibilities are not as great as the medical roentgenologist.

Of the various collateral sciences of medicine, there is perhaps none which has developed more rapidly, or which has assumed a more important bearing in many branches of practice than has the science of roentgenology. With the increased appreciation of its value and its wide adoption, it has been developed through a comparatively short period of evolution, until now it can be regarded, broadly speaking, in the light of an exact science.

In spite of this fact, there is still apparent a great degree of misconception as to the responsibilities of one who is to actively engage in this work.

To the uninitated, this field of labor often presents alluring possibilities, and they are all too apt to rush in without adequate preparation. To such, the reward of bitter disappointment must eventually come, when they become mired in the mud of their own poor judgment, and lack of technical knowledge.

To avoid such an end, or perhaps what is almost as ignominious,—the acquiring of "a partial knowledge" of the subject, which at best can only carry one-half way upon the journey of success—the student should first come to a realization that the practice of roentgenology or any of its branches requires more than a mere training in the mechanics of the x-ray laboratory.

Undoubtedly, many a man has, in the contemplation of x-ray apparatus for his office, *given serious thought to the type of the equipment which he wished to install,* and has assumed that with a modern laboratory, he would be in a position to render the best of service. Such a misguided individual all too soon learns that a *very large part of the battle lies within himself,* and if his own knowledge is deficient, the finest equipment in the world will not make him a roentgenologist.

It is important, therefore, that those who contemplate any indulgence in the field of radiography should not underestimate the task which confronts them.

In addition to becoming familiar with the electrophysics of x-ray laboratory equipment, its practical application in their chosen field, the dangers which surround it if improperly used, one should realize that the real practice of radiography begins when the x-ray picture, or radiogram, has been produced. It is quite impossible for such an image to be of value, unless the radiographer is thoroughly familiar with the anatomy, physiology, and pathology of the field under examination, and even these qualifications are not adequate unless backed up by practical clinical experience.

For those who can qualify, there is a real field and a rare opportunity, and it will be found that every man who engages in this work will receive just that amount of recognition and respect from his colleagues to which his abilities entitle him.

One of the first things which the beginner should do is to become familiar with the terminology of this subject, and cultivate the habit of using terms correctly. Instead of using the term *x-ray picture,* such an image should always be spoken of as a *radiogram,* or as a *roentgenogram.*

The physician or dentist maintaining an x-ray laboratory, should not be called *an x-ray specialist,* but should be spoken of as *a medical or a dental roentgenologist.*

Not infrequently, we hear physicians or dentists speaking of a dental radiogram as *a dental x-ray.* Such an expression only exposes their crudity of thought, and certainly expresses nothing else.

It is thought by some terminologists that in addition to always speaking of the x-ray as the roentgen ray, in honor of the man who discovered it, we should include the name Roentgen in every descriptive word connected with the work. To such, the term *radiograph* (verb) and *radiogram* (noun) will doubtless appear improper, but I feel justified in continuing their use, as these words are thoroughly descriptive and less cumbersome than *roentgenograph* and *roentgenogram.* For the same reason, the term *radiography* is preferred rather than *roentgenography* to designate the art of making radiograms.

Briefly summarized, the following roentgen terminology will be found to be quite adequate:

Roentgen ray, or X-ray:	A phenomenon in physics discovered by William Conrad Roentgen.
Roentgenology, or Radiology:*	The study and practice of the roentgen ray as applied to medicine and surgery.
Roentgenologist, or Radiologist:*	One skilled in roentgenology.
Roentgenogram, or Radiogram:	The shadow picture produced by the x-ray upon the photographic emulsion.
Roentgenograph, or Radiograph:	(Verb.) To make a roentgenogram, or radiogram.
Roentgenography, or Radiography:	The art of making roentgenograms, or radiograms.
Roentgenotherapy, or Radiotherapy:*	Treatment by the application of the roentgen ray.
Roentgen dermatitis, or X-ray dermatitis:	Skin reaction due to too strong or too often repeated application of the roentgen ray.
Roentgenographic examination, or Radiographic examination:	The examination and study of the shadow pictures produced by the x-ray upon the photographic emulsion.
Roentgen diagnosis, or X-ray diagnosis:	Diagnosis by aid of the roentgen ray.
Pathoroentgenography, or Pathoradiography:	The study of pathologic lesions as revealed by the radiogram (or roentgenogram); it implies and renders imperative a knowledge of the pathology and of the interpretation of normal and abnormal tissue densities as recorded in the radiogram.
Roentgenize:	To apply the roentgen ray.
Roentgenization:	The application of the roentgen ray.
Roentgenism:	The untoward effect of the roentgen ray.

Some writers add other descriptive terms to the foregoing list, but I feel that a terminology should be just as brief as is consistent with adequate description; hence, several terms appearing in current literature on different phases of roentgenology have been omitted.

*The term is rather confusing, as it could also refer to the practice and therapy of radium or other radiotherapeutic agents.

Use and Misuse of the X-Ray

DIAGNOSIS is the finest art in medicine. It involves the summation of the experiences of all the other branches of medicine and is the keystone of any system of treatment. A competent diagnostician becomes so only through thorough acquaintance with pathology and natural history of disease processes, correlated with ample clinical experience. Naturally, there are no short cuts to diagnosis. It is true that brilliant diagnoses may occasionally be made at a glance or by the use of a single laboratory expedient. Such episodes, however, carry with them great danger and conduce to superficiality, lack of thoroughness, and frequent application of the supposed short-cut methods.

Time and again serious mistakes, disastrous to both patient and doctor, occur when such methods continue to be applied with confidence after a brilliant diagnostic coup. He who wishes to avoid such pitfalls will resort to no single method of diagnosis.

We have with us at present an evergrowing tendency to resort to the x-ray, or the roentgenologist, as the sole or principal means of diagnosis. Murphy has styled them mechanical diagnoses, and correctly so.

The x-ray originated in Germany and was first applied there clinically, chiefly in the diagnosis and localization of foreign bodies and in identification of fractures. Cannon of Boston, Pfahler of Philadelphia, and Hemmeter of Baltimore, were the first to use it for the study of physiology and diagnosis of conditions other than foreign bodies and fractures. They, however, did not develop the method sufficiently to make it practicable, nor did they grasp its possibilities until Rieder, Groedel, Holtzknecht and their pupils had taken it up and developed most of what we today know about it. Technically, Americans have made brilliant advances and made the method widely available.

While great good has come and will continue to come from improved technic, nevertheless, the general use of the x-ray by those not properly trained in pathology and x-ray interpretation has resulted in an infinite amount of error and clinical disaster. Even some of our best known roentgenologists have not escaped and our roentgenologic literature is filled with fantastic ideas and useless advice and procedures, because the American roentgenologist has not been sufficiently trained, as has his European collaborator, in the fundamental branches of medicine, chief of which are pathology and clinical hospital experience.

It is a matter of daily experience to find patients rushed to the x-ray laboratory before any clinical investigation has been made of the case, and often organs have been photographed which would be not at all likely to show any results. Far-reaching interpretations are being placed upon most trivial and often normal findings. This holds particularly true of the lungs and the gastrointestinal tract. Bands of active tissue and sharply defined calcified areas in or about the lungs are interpreted as active processes. Normal shadows and shadows due to plate, posture, and developmental defect are interpreted as disease. Peristaltic waves, spasm, and defects shown on single plates or examinations are repeatedly interpreted as ulcer or cancer in the stomach. Minor degrees of

atony or elongation of the stomach and colon are interpreted as ptosis, and surgical procedures advised; to say nothing of such procedures advised through misinterpretation of other normal, or slightly pathologic, functional states.

On the other hand, through the same sources of error and neglect to appreciate the value of the x-ray, many conditions are overlooked. Probably as many errors are being made through lack of appreciation of the finer changes as are being made through the exaggeration of unimportant changes.

The remedy is coming, but slowly, that is, to insist upon a more thorough fundamental training of all roentgenologists; in fact, a training as great as that of the internist or the surgeon, that they, in turn, may better instruct the profession at large to appreciate that the x-ray should always be considered only as one link, no matter how certain it may be, in the evidence leading to a diagnosis. —*C. E. Sears, M.D., in Medical Sentinel.*

How the New Income Taxes Hit Your Pocket

This table, prepared for the *New York Tribune*, shows how to compute your income tax, beginning with the rates under the law of 1916, and adding the taxes provided by the new war revenue bill.

Income Married Men	Normal Tax (Old Law)	Additional Normal Tax (New Law)	Surtax (Old Law)	Additional Surtax (New Law)	Total Tax
$1,000.....	Exempt	Exempt	Exempt	Exempt	None
2,000.....	Exempt	Exempt	Exempt	Exempt	None
3,000.....	Exempt	2% on $1,000	Exempt	Exempt	$20
4,000.....	Exempt	2% on 2,000	Exempt	Exempt	40
5,000.....	2% on $1,000	2% on 3,000	Exempt	Exempt	80
6,000.....	2% on 2,000	2% on 4,000	Exempt	1% on $1,000	130
7,000.....	2% on 3,000	2% on 5,000	Exempt	1% on 2,000	180
8,000.....	2% on 4,000	2% on 6,000	Exempt	1% on 2,500 2% on 500	235
9,000.....	2% on 5,000	2% on 7,000	Exempt	1% on 2,500 2% on 1,500	295
10,000.....	2% on 6,000	2% on 8,000	Exempt	1% on 2,500 2% on 2,500	355

An unmarried man pays a tax on his income beyond $3,000 under the old law and beyond $1,000 under the new law.

An unmarried man with an income of $5,000 pays 2 per cent on $2,000 under the old law and an additional 2 per cent on $4,000 under the new law.

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EDITORIALS

The Etiology of Malocclusion

THERE have been few questions pertaining to malocclusion which have produced so much discussion or brought forth so many different opinions as has the question of etiology. If one would take the time to review the orthodontic literature, he would find that the causes of malocclusion have always occupied an important field. He would also find that the writers on the subject have been divided into two groups in the old days, those claiming that malocclusion was the result of inheritance and those who claimed that it was the result of purely local conditions. As is the case with a great many questions, the real solution of the problem lies somewhere between the two extremes.

In approaching the question of the etiology of malocclusion in the same manner that any other pathologic matter is approached, we are forced to divide it into two groups; namely, those factors which can be grouped accord-

ing to the time in which they occur and the others according to the manner in which they occur.

Much has been written upon the question of the etiology of malocclusion from a pathologic standpoint during the last few years and the causes have been classified according to the plan which we have outlined. As regards the time, they may be divided into inherited, congenital, and acquired. In regard to the manner in which they develop, they may be divided into local and constitutional. In speaking of local and constitutional causes, we might further elucidate by saying that certain writers have made a division slightly different, in which they have attributed a large number of malocclusions to purely mechanical conditions, or to results arising from abnormal forces of occlusion or abnormal mechanical stress brought to bear upon the teeth and the developing structures. Those writers that have attributed the majority of malocclusions to purely mechanical conditions have, to a great extent, overlooked constitutional causes or conditions which may have a physiologic origin in the cell metabolism of the individual. Faulty development may be the result of conditions occurring in the maternal structure before birth and thereby effecting the embryo.

Investigations into the constitutional causes of malocclusion and conditions which may arise early in life have been carried on by Hellman, Kirk, Mershon, and Weinberger, and papers dealing upon this subject have been published by these writers during the last few years. However, regardless of the large number of valuable contributions to the orthodontic literature which we have dealing with the etiology of malocclusion; showing the relation of malocclusion as a pathologic condition which may arise from a congenital or constitutional disturbance, there still remain a number of writers who cling to the mechanical phase of malocclusion and attribute all malocclusions to purely mechanical conditions.

In the October issue of the *Dental Cosmos* there appear two articles by well-known men who have taken almost exactly the opposite position to each other. One of the writers, following the modern and scientific line of thought, makes the statement that a large number of malocclusions have their beginning probably in the very early stage of development. He states that it is not a mechanical problem at all, but a problem of biology, and one which must be approached from that standpoint. He also states that the abnormal pathologic development of the bones of the face in which the teeth are located is generally the result of faulty development of the child from birth, or probably before birth. This is very probably the more scientific explanation of the cause of a large number of malocclusions than it is to attempt to explain all malocclusions by one or a very few etiologic factors.

Opposed to malocclusion being produced by faulty development as the result of abnormal cell metabolism and constitutional conditions, we find another writer stating that "mouth breathing is by far the most frequent cause of malocclusion of the teeth. With the exception of those malocclusions caused by anomalies such as supernumerary teeth, transposed teeth, and impacted teeth and so forth, all malocclusions may be ascribed to nasal obstruction in early life." It would

be indeed a very fortunate thing if it could be proved that all malocclusions were the result of nasal obstruction in early life, because it would eliminate a large number of the hardships which we have encountered in treatment. However, modern investigation does not prove the fact that malocclusions are the result of mouth-breathing anywhere near to the extent attributed by the writer referred to. There is no question but that mouth-breathing in some cases does play a large part in the production of malocclusion, but if we go back further, there might be a constitutional condition which has been responsible for the mouth-breathing. At the present time, no one seems to know exactly why we have hypertrophied lymphoid tissue in the nasal pharynx and why certain pathologic conditions in the nose and throat occur, which produce mouth-breathing and contribute to the resulting malocclusion.

We do not believe that the solution of etiology will be found by limiting ourselves to the study of any one condition or by making positive statements that mouth-breathing produces all malocclusions except those mentioned in the above referred article. We believe that great advance will be made when the profession realizes that malocclusions are really a pathologic problem, and a great many of them have their beginning at a time when it is impossible to recognize them from a mechanical standpoint. It must be remembered that in the treatment of malocclusion we are not dealing entirely with a mechanical problem, but are dealing with a biologic problem in attempting to produce biologic growths according to such methods as we can employ. The sooner the orthodontic profession realizes that constitutional disturbances and faulty developments are factors which must be met and studied, the sooner will orthodontics make the advance to which it is entitled and receive the recognition from the medical profession it should receive.

Our New President

THE subject of our frontispiece this month is D. Willard Flint, D.D.S., of Pittsburgh, Pa., who was elected President of the American Society of Orthodontists at the Seventeenth Annual Meeting in Excelsior Springs, Mo., Sept. 5th, 1917.

Born in Canada, Dr. Flint attended the Chatham Collegiate Institute for six years, later the University of Michigan, and then the University of Pittsburgh. In the latter institution he held the chair of Orthodontia for five years. He is also a graduate of the Angle School of Orthodontia, Class of 1902.

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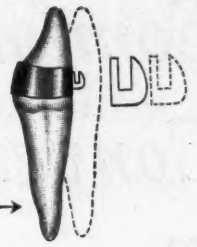

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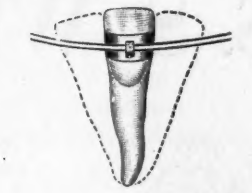

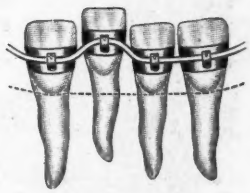

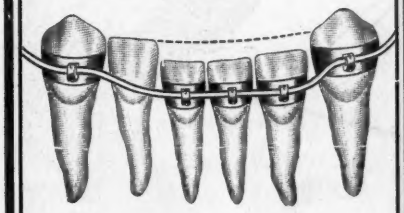

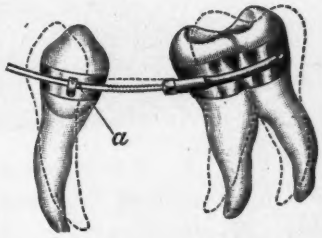

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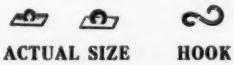

ACTUAL SIZE HOOK

ENLARGED ILLUSTRATION

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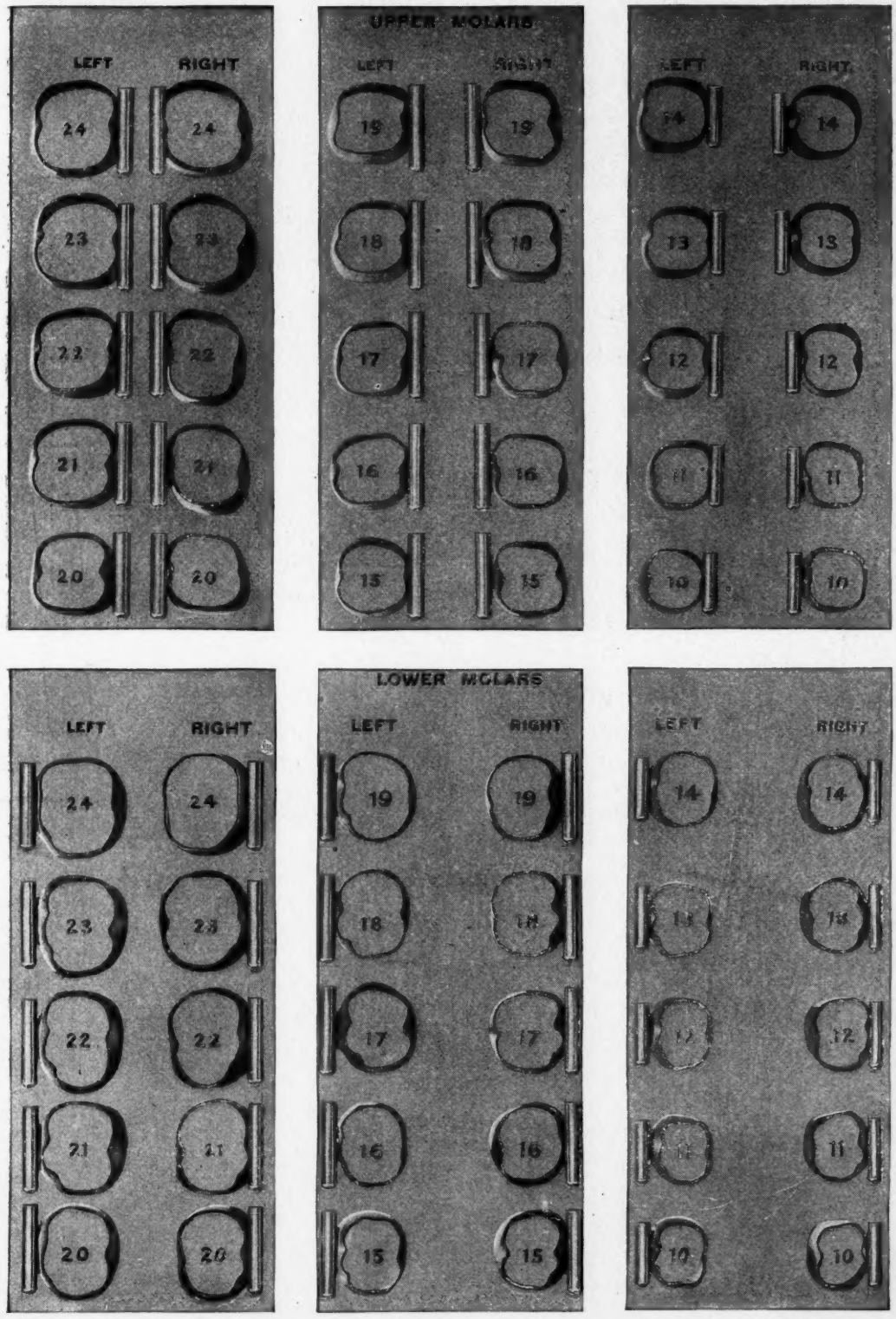

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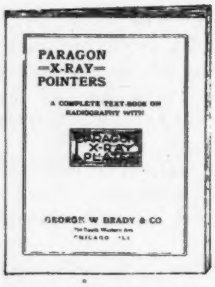

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2. The purchaser agrees to read the complete operating directions included with the machine, before attempting to operate the machine on his own accord. It is also recommended that some one of the books on Dental Radiography be read.

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4. Purchasers are welcome to consult us in our office or by telephone with regard to the operation of the machine, at any time and without charge.

5. The entire organization of the manufacturers at Mount Vernon, New York, Chicago or San Francisco is placed at the disposal of the purchasers, whose letters, telephone calls or personal calls with reference to any subject will be welcomed and without cost.

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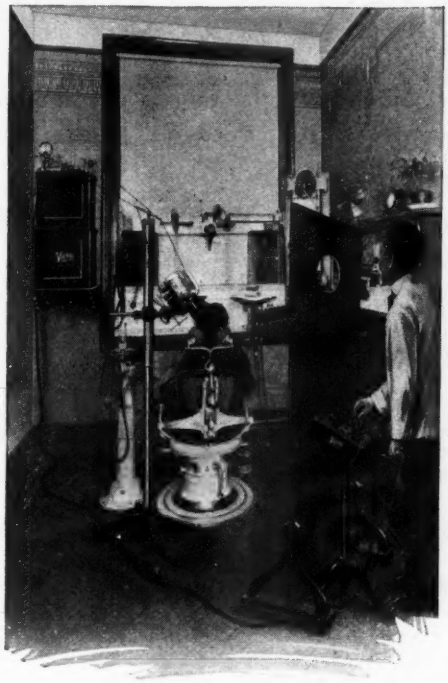

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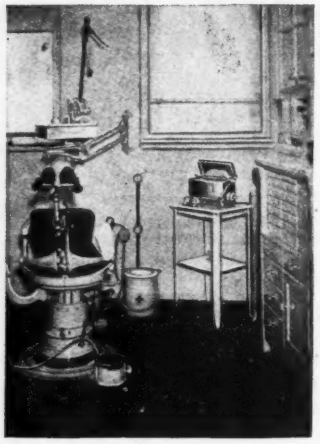

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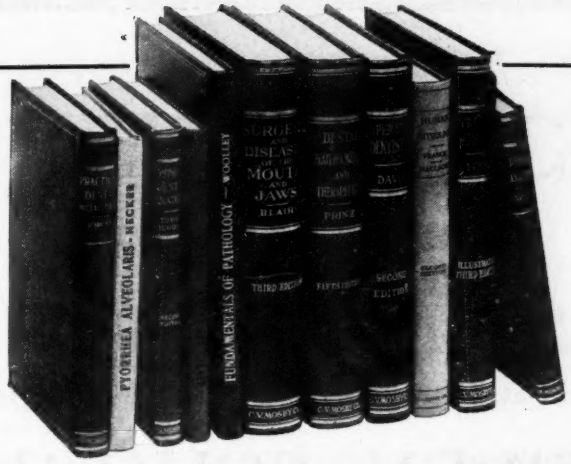

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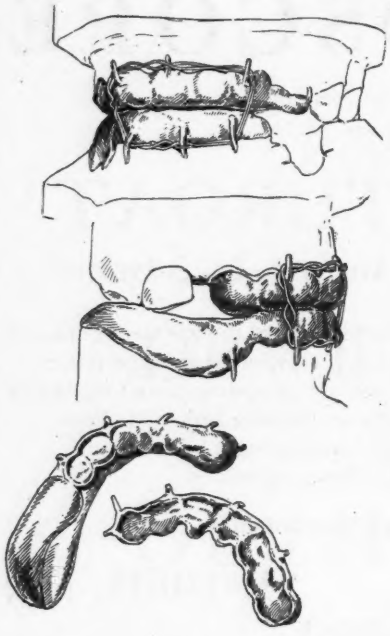

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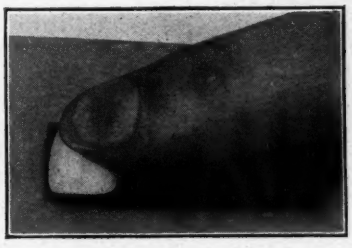

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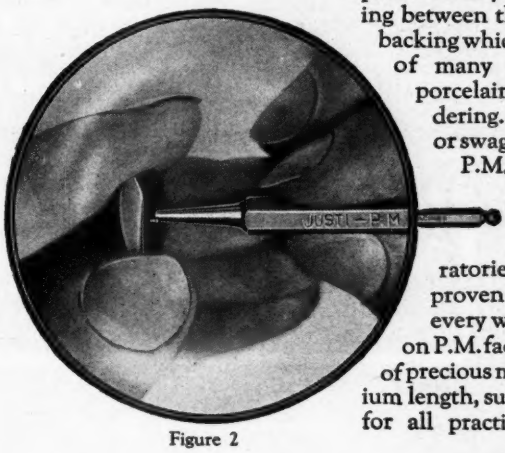

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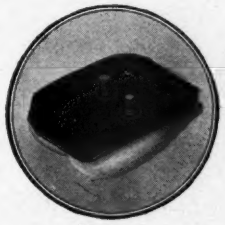

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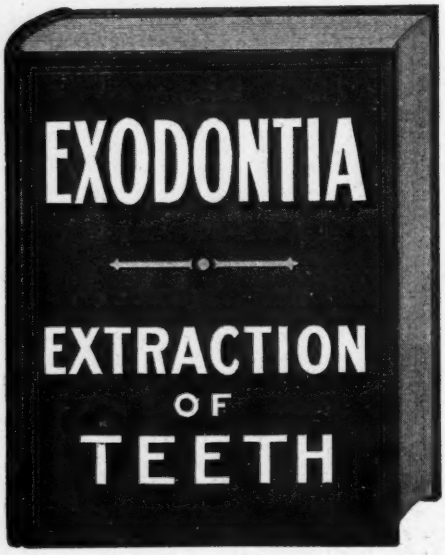

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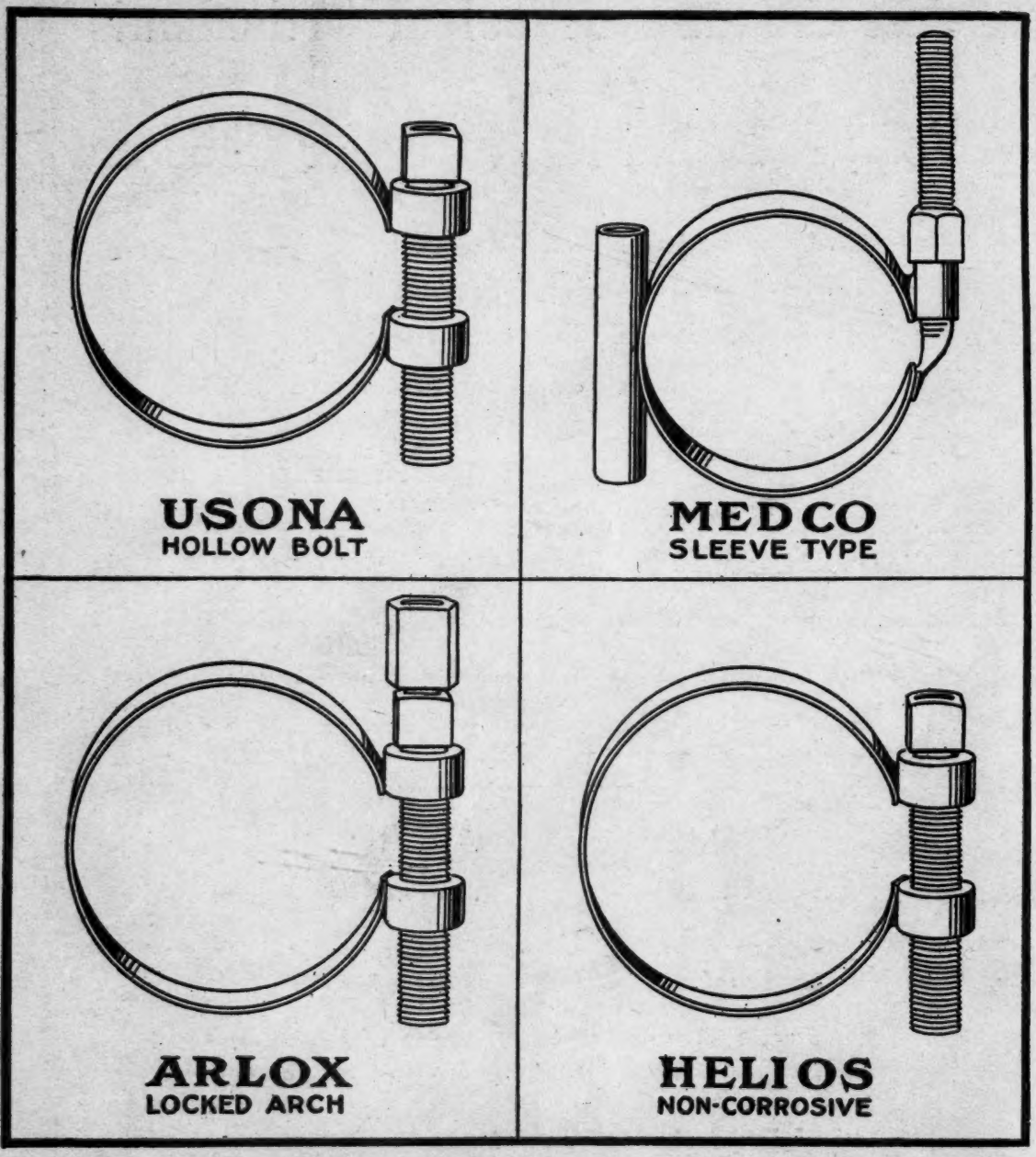

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